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State of California
Regional Water Quality Control Board
Los Angeles Region

COMPREHENSIVE GROUND WATER MONITORING EVALUATION
OF THE
SOUTHERN CALIFORNIA CHEMICAL COMPANY

EPA ID NO. CAD008488025

3 June 1988
(revised 15 June 1988)

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION
107 South Broadway, Room 4027
Los Angeles, California 90012

Comprehensive Ground Water Monitoring Evaluation
FY 87-88

FACILITY: Southern California Chemical Co.
8851 Dice Road
Santa Fe Springs, CA 90620

EPA ID NO.: CAD008488025

DATES OF INSPECTION: 2-4 February 1988

TYPE OF INSPECTION: CME

TASK FORCE MEMBERS: Brian Lewis, DHS Headquarters
David Schwartzbart, DHS Regional
Bill Levine, SWRCB

DATE OF REPORT: 3 June 1988 *How related to RWRC*

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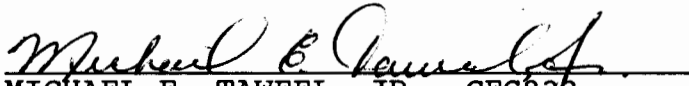
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1.0 CERTIFICATION

On 2-4 February 1988, Athar Khan, Sanitary Engineering Associate with the California Regional Water Quality Control Board, Los Angeles Region, made a RCRA Comprehensive Ground Water Monitoring Evaluation (CME) field inspection of the ground water monitoring program at Southern California Chemical Company. The CME also included a review of the facility file, quarterly monitoring reports of ground water quality, and geological reports prepared by J. H. Kleinfelder & Associates.

Also accompanying on the site inspection were members of the CME Task Force: Brian Lewis, DHS Headquarters and Bill Levine, State Water Resource Control Board (SWRCB). In addition, Nancy Ball, Hazardous Materials Laboratory-Berkeley, assisted with the sampling audit.

This report includes a brief description of the facility, the geology and hydrogeology of the area, the ground water quality, and the ground water monitoring system at the facility. The report also includes copies of DHS checklists with reviewer comments about the adequacy of the monitoring system. Some changes and modifications to the original draft report, by Athar Kahn, were done by Jennifer S. Schroll, Engineering Geologist with the Regional Water Quality Control Board, Los Angeles. Technical review of the CME report was provided by the CME Task Force and Michael E. Taweel, Jr.


MICHAEL E. Taweel, Jr., CEG823
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2.0 EXECUTIVE SUMMARY

2.1 Introduction

*is SWRCB
the central
office
for RWQCB*

On behalf of the California Department of Health Services (DHS), Regional Water Quality Control Board (RWQCB) staff conducted a Comprehensive Ground Water Monitoring Evaluation (CME) of the ground water monitoring program at Southern California Chemical Company facility in Santa Fe Springs (Figure 1). The RWQCB was assisted in this CME by Interagency CME Task Force members, Brian Lewis, DHS Headquarters; David Schwartzbart, DHS Regional Office; and Bill Levine, (SWRCB) as per the 1987-1988 Interagency Agreement between DHS and SWRCB. Nancy Ball, Hazardous Materials Laboratory, Berkely, assisted with the sampling audit.

attended

The objective of this CME was to evaluate the ground water monitoring program at Southern California Chemical Company for compliance with the Resource Conservation and Recovery Act (RCRA) interim status requirements specified in 40 CFR Parts 265.90, 265.91, 265.92, 265.93, 265.94, and 270.14. This CME will also aid in evaluating Southern California Chemical Company Closure Plan for RCRA compliance.

attended

On January 20, 1988, a preinspection meeting of DHS Task Force members and RWQCB staff was held. At this meeting, numerous items were discussed, such as regulatory history, site-specific conditions, onsite health and safety, duty requirements, and Appendix A. On February 2, 1988, site inspectors met with the owner/operator at the facility, reviewed facility records, and measured water levels. The visual site inspection occurred the next day, at which time ground water sampling procedures were observed. A post-inspection meeting of regulatory agency staff and facility representatives took place on February 4, 1988, to review the history and development of the ground water monitoring system.

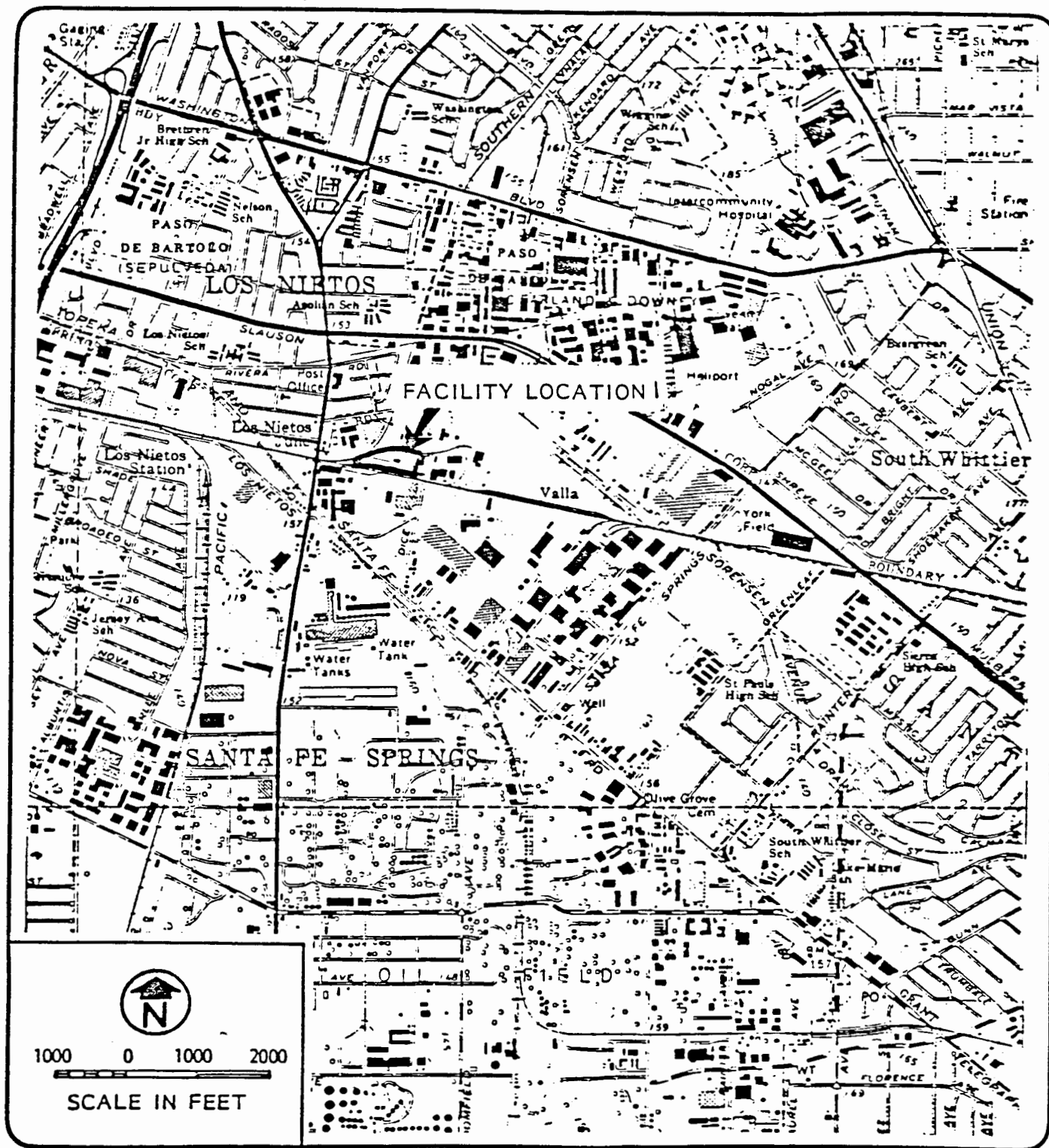


Figure 1

SITE LOCATION OF SOUTHERN CALIFORNIA CHEMICAL CO.
SANTA FE SPRINGS FACILITY

2.2 Facility Background

Since 1958, the facility has been used to manufacture ferric chloride solutions, copper sulfate solutions, copper oxides, and etchants (including a line of proprietary ammoniacal etchants patented by the owner/operator). These chemicals are manufactured from raw materials, spent etchants, caustics, and acids. During the manufacture of the copper oxides and certain other products, alkaline wastewater is generated. However, records regarding facility processes and manufacturing areas are extremely confusing; it appears that the owner/operator has changed processes many times and equipment has often been moved around the property resulting in the presence of various potential sources of contamination.

Between 1975 and 1985, process wastewater from various portions of the facility was collected and treated in a 36,000-gallon waste management unit referred to as Pond 1. Pond 1 is the only designated RCRA unit, although there are several solid waste management units (SWMU's) that are regulated per the 1984 RCRA amendments. The location of this surface impoundment is shown in Figure 2. According to the owner/operator, Pond 1 was constructed above an existing concrete pond used to collect zinc sulfate wastewater. Pond 1 was constructed with six inch steel reinforced concrete two feet above grade and one foot below grade.

Company records indicate that the contents of the surface impoundment varied only slightly during the ten years of operation (Table 1). Although the pH of the wastewater was generally basic, the type of chemical used for treatment depended on the characteristics of the waste. Under permit from the County Sanitation Districts of Los Angeles County, neutralized effluent was then discharged into the sanitary sewer system through a four-inch underground pipeline. Precipitated sludges at the bottom of the surface impoundment were either pumped out periodically and routed through a filter press, or removed and hauled to a Class I disposal site.

TABLE 1

CHEMICALS USED IN POND 1

Ammonium chloride
Ammonium sulfate solution
Free ammonium
Chrome sulfide
Chromic-sulfuric acid solution
Copper ammonium chloride solution
Copper sulfide
Ferrous hydroxide solution
Iron sulfide

Lead sulfide
Nickel sulfide
Sodium chloride solution
Sodium sulfate solution
Sulfuric acid solution
Zinc sulfide

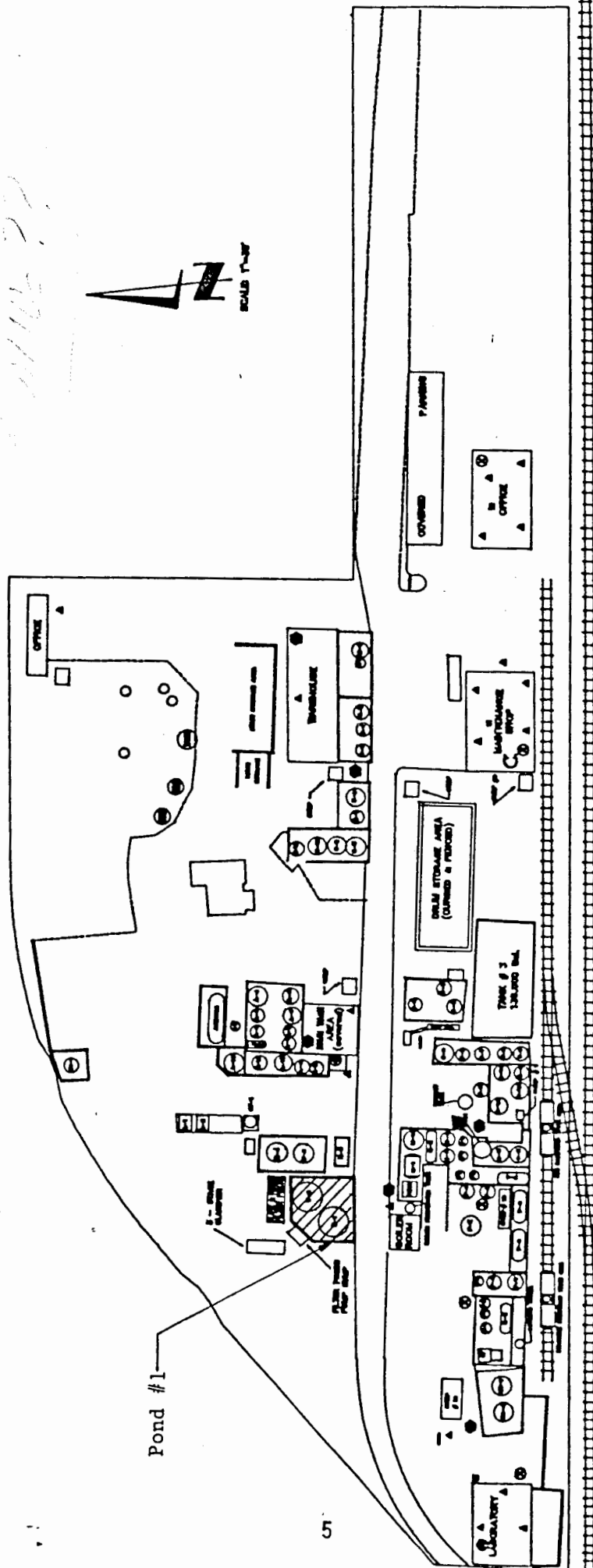


Figure 2 SITE PLAN
 SOUTHERN CALIFORNIA CHEMICAL CO.
 1957
 1957

On May 8, 1985, the U. S. Environmental Protection Agency (EPA) made a formal request for Part B of the application filed by the owner/operator for a hazardous waste facility permit under the Resource Conservation and Recovery Act. However, in July 1985, the surface impoundment was taken out of service and replaced with two 30,000-gallon fiberglass-reinforced plastic tanks. (Since that time, the former surface impoundment has been intended to provide secondary containment for these above-ground tanks.) It should be noted that this change of status was made without an approved closure plan. In fact, the first of two closure plans [11] was not received until July 30, 1985 after closure had been started. In March, 1986 the Regional Board informed DHS that the closure plan was inadequate. Included in these comments, RWQCB staff informed DHS that the owner/operator would have to submit a revised closure plan which contained information on post-closure maintenance pursuant to Section 13227 of the California Water Code. In October, 1987 a second closure plan [12] was submitted. On December 30, 1987 DHS issued a Notice of Deficiency (NOD). In April 1988 DHS, EPA, and RWQCB staff held a meeting to discuss a strategy for closure of Pond 1. DHS staff agreed to send a letter to Southern California Chemical Company, as an addition to the December, 1987 NOD, advising them of the closure strategy and asking for submittal of a revised closure plan based on this strategy.

2.3 Summary of Ground Water Monitoring System

Following is a summary of potential deficiencies of the ground water monitoring program at Southern California Chemical Company. Deficiencies are discussed within the Appendix A checklist and review comments. Specific technical inadequacies of the ground water investigation and monitoring system at the facility, which may constitute RCRA violations under 40 CFR 265.90, 265.91, 265.92, and 270.14, are listed below. Some of the technical inadequacies may be deficiencies in meeting professional performance standards in performing a complete professional hydrogeological assessment of a hazardous waste facility and do not necessarily constitute violations. The capitalized headings represent ground water performance standards for RCRA facilities that correspond to the cited code of the Federal Register:

40 CFR 270.14(c)(2); 40 CFR 265.90(a):

THE UPPERMOST AQUIFER MUST BE CORRECTLY IDENTIFIED

1. The uppermost aquifer has not been adequately defined. Data has been presented by the owner/operator suggesting that the Gage and/or the Jefferson Aquifer may be the uppermost aquifer(s). Potential interconnections of these units have not been adequately investigated and reported.
2. The geologic consultant for SCCC incorrectly used a regional cross section taken from DWR Bulletin 104 [2] that does not apply to this site. In addition, the consultant mislocated the site on this cross section and as a result, has

misidentified the subsurface stratigraphy. Specifically, the uppermost water bearing aquifer, as defined by the consultant, should be the Hollydale Aquifer not the Jefferson Aquifer.

3. Characterization of the geology and hydrogeology underlying the site is incomplete and inadequate. Stratigraphy, lithology, structure, and primary and secondary permeability are some of the factors that have not been adequately addressed. Submitted reports lack adequate site specific geologic maps, topographic maps, and cross sections. Submitted reports also do not reflect the current physical status of the facility structures and grounds. These data must be provided to adequately characterize the subsurface stratigraphy and identify the uppermost aquifer.

40 CFR 270.14(c)(2):

HYDRAULIC INTERCONNECTION BETWEEN AQUIFERS MUST BE DETERMINED

4. The degree of hydraulic interconnection between the uppermost aquifer and any underlying or adjacent aquifer should be determined. The presence or absence of a reported confining layer above and below the Hollydale Aquifer should be confirmed.

40 CFR 270.14(c)(2):

GROUND WATER FLOW PATHS, DIRECTIONS, AND VELOCITIES MUST BE PROPERLY DETERMINED

5. Velocities have not been calculated by the owner/operator. In addition, vertical ground water gradients have not been adequately determined.
6. Effects of local pumping and/or discharge needs to be investigated.

40 CFR 265.91(a)(1):

BACKGROUND WELLS MUST BE LOCATED SO AS TO YIELD SAMPLES THAT ARE NOT AFFECTED BY THE FACILITY

7. The owner/operator has not demonstrated that there are upgradient monitoring wells in sufficient numbers, locations, and depths to yield ground water samples that are (1) representative of background ground water quality in the uppermost aquifer near the facility, and (2) not affected by the facility. The hydrogeology of the uppermost aquifer has not been characterized.

40 CFR 265.91(a)(2):

DOWNGRAIENT MONITORING WELLS MUST BE LOCATED SO AS TO ENSURE THE IMMEDIATE DETECTION OF ANY CONTAMINANT MIGRATING FROM THE FACILITY

8. The owner/operator has not demonstrated that there are downgradient monitoring wells in sufficient numbers, locations and depths to yield ground water samples that are representative of water quality in the uppermost aquifer. The vertical gradient may be sufficiently steep at the downgradient area that additional wells with deeper screens will be required.

40 CFR 265.91(c):

MONITORING WELLS MUST BE CONSTRUCTED SO AS TO YIELD SAMPLES THAT REPRESENT UPGRADIENT AND DOWNGRAIENT WATER QUALITY

9. The owner/operator has not demonstrated that there are monitoring wells in sufficient number, location, and depth to yield representative ground water samples.

10. Well construction deficiencies:

- improper placement of well screen intervals
- improper placement of filter pack in relation to well screen
- caved materials in screen intervals
- improper seals
- improper well caps
- improper determination of filter pack and screen slot sizes

40 CFR 265.92(a):

A GROUND WATER SAMPLING AND ANALYSIS PLAN MUST BE DEVELOPED AND FOLLOWED

11. The owner/operator has submitted an inadequate sampling and analysis plan. Contained within the Work Plan [7] appendices, the sampling and analysis plan says only that "sampling methods will be in accordance with 14th Edition of Standard Methods."

12. Some inadequacies noted during inspection:

- There is no sampling schedule
- The sample collection-pump rate is not specified
- Details for filling sample containers from the pump stream to avoid aeration are not specified
- There are no specifications for adding preservatives
- There are no labeling instructions
- A bound log book must be used for recording all field data and observations, rather than loose sheets of paper

- There are no analytical procedures or detection limits specified
- Inadequate meter calibration
- There are no provisions to check for floaters and sinkers
- Inadequate decontamination procedures and sampling cleanliness
- There are no specified lab procedures
- Some samples taken were observed to be turbid
- Head space was observed in TOX and TOC sample vials

40 CFR 270.14(c)(4):

ANY PLUME OF CONTAMINATION THAT HAS ENTERED THE GROUND WATER FROM A REGULATED UNIT MUST BE DESCRIBED

13. No determination of the extent and rate of migration of the contaminant plume(s) has been made.

3.0 TECHNICAL REPORT

3.1 Environmental Setting

The facility is located in the Santa Fe Springs Plain, part of the Coastal Plain of Los Angeles County. The Santa Fe Springs Plain is an alluvial plain located northwest of an anticlinal feature in Coyote Hills. The surface exposure at Southern California Chemical Company is the Lakewood Formation, comprised of upper Pleistocene stream and flood plain deposits. The Lakewood Formation (containing the Gage Aquifer) unconformably overlies the San Pedro Formation, which contains the Hollydale, the Jefferson, the Silverado, and the Sunnyside Aquifers in increasing depth order [2].

According to the facility consultant, average annual rainfall for the area is approximately 13 to 14 inches. The Sorenson Avenue flood control channel, which is located approximately 0.25 mile northeast to the facility, is the only surface water feature within a one-mile radius of the facility. The San Gabriel River is slightly over one mile west of the facility. The associated recharge basins are located 1.5 to 2.0 miles northeast of the facility. Streams in this area are intermittent due to the semi-arid climate of southern California.

3.2 Geology and Hydrogeology

The stratigraphy beneath the facility begins with fine-grained sediments of the Bellflower Aquiclude, the least permeable portion of the Lakewood Formation. This aquitard, which ranges from 5 to 15 feet thick, consists of gravelly clays, silts, silty clays, and sandy clays [9].

The lower portion of the Lakewood Formation is the Gage Aquifer, a fine to medium sand unit approximately 20 feet thick. Soil borings at the facility suggest that the base of the Gage Aquifer occurs at an average depth of 30 feet [2].

The San Pedro Formation, comprised of lower Pleistocene deposits, unconformably underlies the Lakewood Formation. The uppermost layer of the San Pedro Formation is an aquitard comprised of clayey silts and silty clays. This aquitard ranges from 5 to 30 feet thick at the facility and separates the Gage Aquifer from the Hollydale Aquifer [2].

The Hollydale Aquifer is encountered at an average depth of approximately 60 feet beneath the facility and extends to 100 feet below the facility where another thin aquitard is encountered [2].

The regional ground water gradient in both the Gage and Hollydale Aquifers is to the southwest. Figure 3 is the most recent ground water elevation map prepared by J. H. Kleinfelder & Associates

EXPLANATION

MW-11 MONITORING WELL
ELEVATION (FEET ABOVE MEAN SEA LEVEL)
OF GROUND WATER ON 9/20/85

108.00 GROUNDWATER CONTOUR
LINE OF EQUAL ELEVATION ON 9/20/85

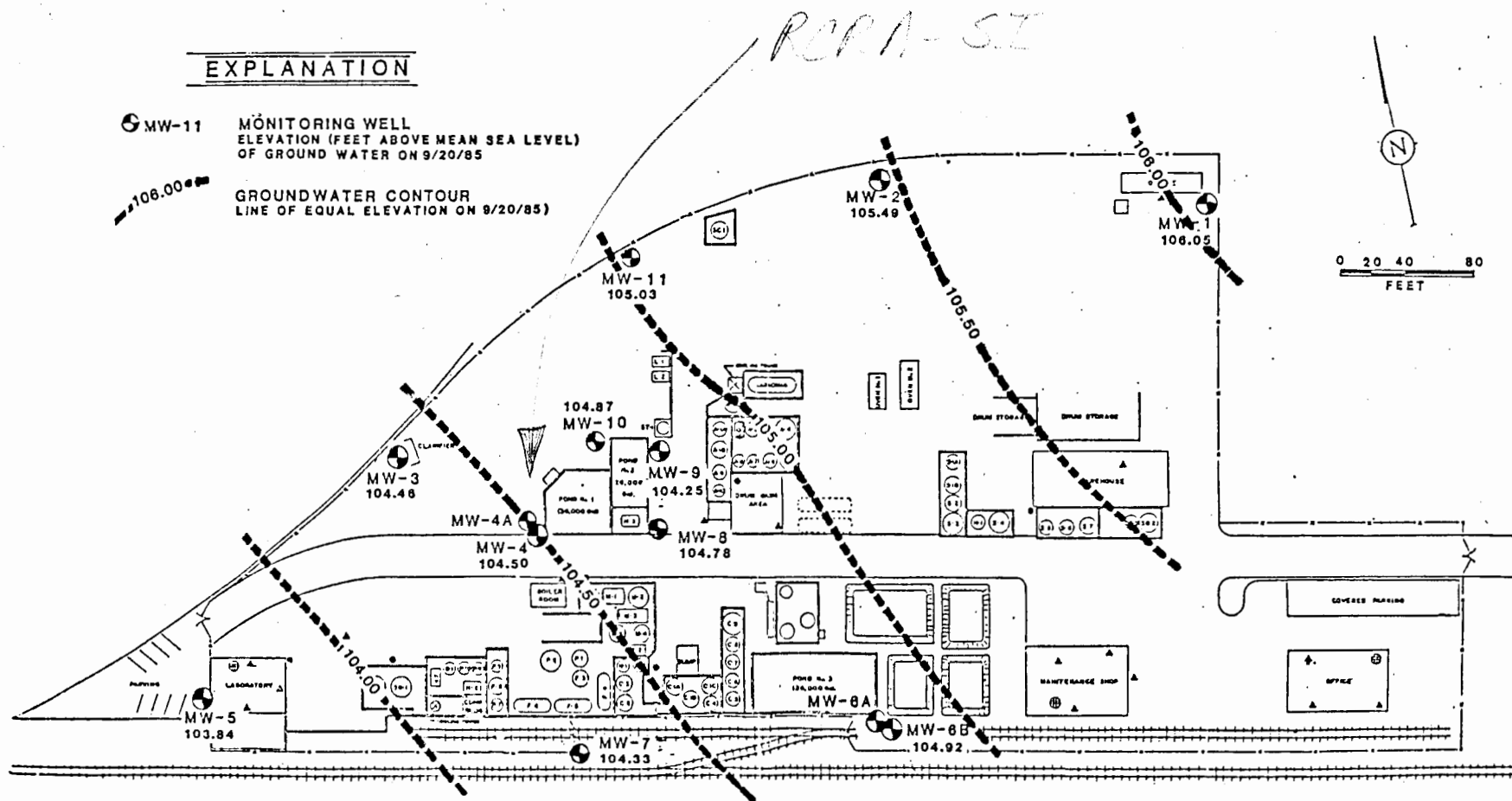


Figure 3. Ground Water Elevation Map

J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING



SOUTHERN CALIFORNIA CHEMICAL
SANTA FE SPRINGS, CA.

GROUNDWATER ELEVATION
CONTOUR MAP
SEPTEMBER 20, 1985

PROJECT NO. Q 1014-2

PLATE

28

[9]. Figure 4 is a ground water elevation map prepared by the CME Task Force. Depth to ground water measurements taken during the visual site inspection and used to generate the Task Force map are included in Table 2. These data tend to confirm that the ground water gradient is toward the southwest.

TABLE 2

Southern California Chemical Company
CME Evaluation of Ground Water Monitoring Wells
3 February 1988

Well #	Datum (MSL) (ft)	Depth to Water (ft)	Groundwater Elevation (ft)
1	152.62	52.49	100.13
2	151.56	52.32	99.24
3	151.62	53.40	98.22
4	149.76	51.55	98.21
4A	152.49	54.02	98.47
5	153.21	55.69	97.52
6A	149.31	dry	dry
6B	149.46	51.02	98.44
7	149.27	51.35	97.92
8	149.53	51.34	98.19
9	151.14	52.29	98.85
10	151.60	52.91	98.69
11	152.80	53.83	98.97

According to the facility consultant, there are four production wells (2S/11W-29E05, 2S/11W-30Q05, 2S/11W-30R03, and 3S/11W-32J04) located within a one mile radius of the facility that may be affecting the local gradient. No other information about these wells was provided.

Table 3 is taken from "Environmental Assessment" [9] and contains historical ground water elevation data.

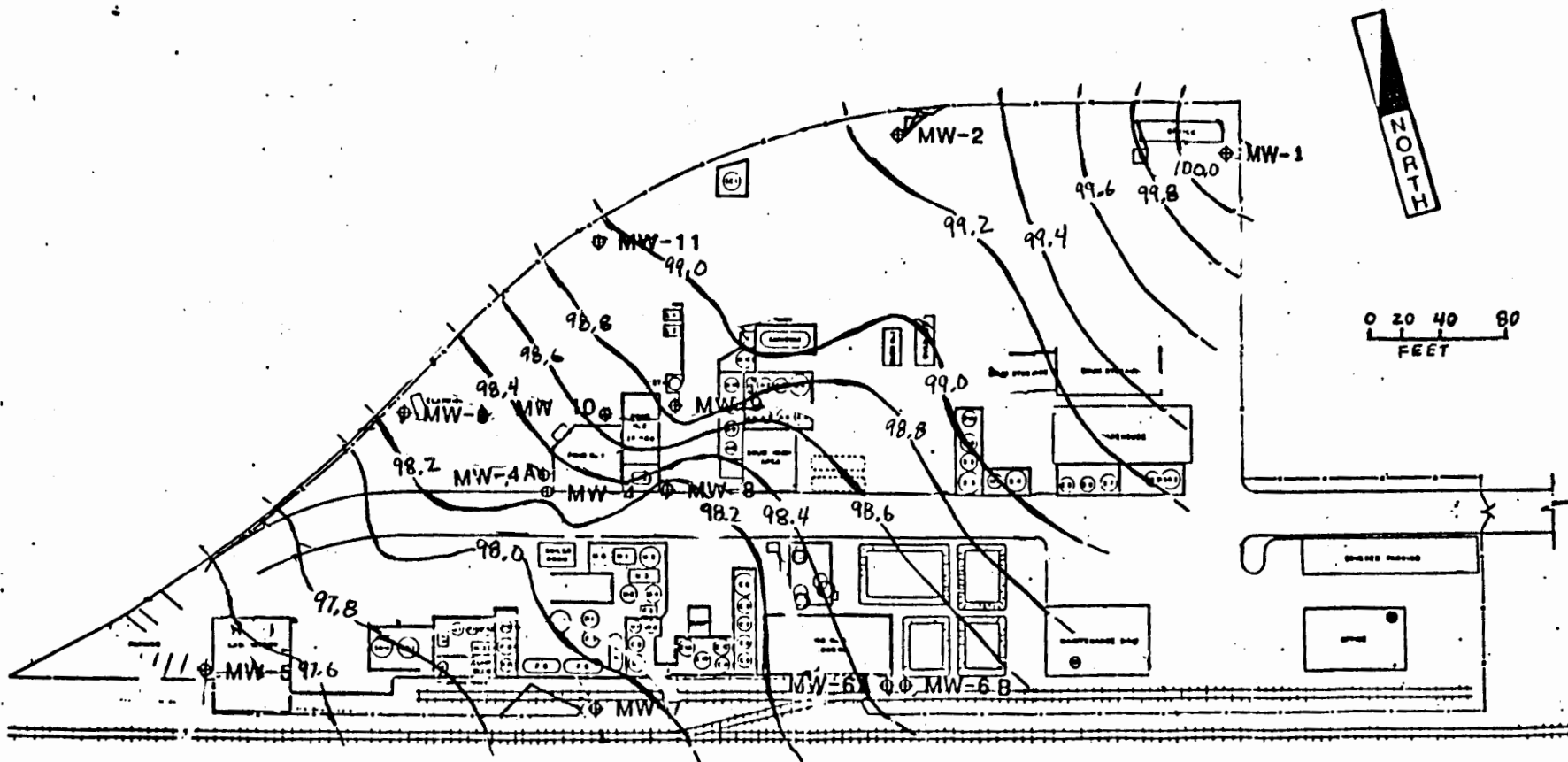


Figure 4 CME TASK FORCE GROUNDWATER CONTOUR MAP
 Based on water levels taken on 2/3/88
 Data from MW-4A not considered
 CI=.2 feet
 Elevations are in Feet Above Mean Sea Level

TABLE 3

GROUND WATER LEVEL ELEVATIONS
(feet MSL)*5-7' drop in 2 years*

Well #	Well Depth	2-22-85 3-12-85	7-24-85 4-09-85	8-05-85	8-19-85	9-20-85	3-19-86	7-09-86	9-24-86	12-17-86	3-31-87	7-01-87	10-17-87
1	62.5	108.49	108.48	109.66	108.16	106.05	103.40	107.78	105.15	103.85	103.71	103.57	100.09
2	75.0	107.31	107.72	109.21	107.56	105.49	102.44	107.04	104.05	102.96	106.58	103.95	98.85
3	75.0	106.37	107.52	108.37	106.65	104.46	101.22	106.03	103.15	102.07	102.96	101.87	97.77
4	75.0	105.76	108.11	108.36	105.16	104.50	101.42	105.94	102.98	101.81	101.78	102.95	97.76
4A	107.0			108.84	109.43	104.49	102.67	107.29	104.29	102.09		104.19	98.92
5	75.0	105.71	106.02	107.68	106.03	103.84	100.46	105.40	102.49	101.41	101.37	98.51	96.24
6A	30.0		119.39		120.91								
6B	77.5	106.46	106.80		107.81	104.92	101.48	106.02	103.21	102.16	101.95	103.11	98.28
7	75.0			107.48	105.34	104.33	101.07	105.73	102.63	101.57	101.52	99.20	97.75
8	71.0			107.95	106.86	104.78	101.65	106.26	103.17	101.98	101.68	101.52	98.12
9	77.0			108.35	106.98	104.25	102.14	106.72	103.64	102.74	104.02	103.53	98.56
10	75.0			107.88	106.94	104.87	102.80	106.26	103.15	102.40	102.62	102.14	98.01
11	75.5			108.38	107.17	105.03	101.96	106.61	103.34	102.65	102.91	102.41	98.21

Taken from "Environmental Assessment" [9]

3.2.1 Well Development and Pumping Tests

To date, three separate proposals/workplans have been submitted by J. H. Kleinfelder & Associates [4, 5, 7]. In each document, the consultant consistently states that newly installed ground water monitoring wells "will be developed by . . . either pumping, bailing, or air lift with a foot valve at the bottom of the intake line to avoid introducing air into the aquifer." This statement is misleading since the consultant has relied exclusively on air lifting for well development [6, 8, 9]. Pumping and/or bailing has not been used.

On August 19, 1985, a step drawdown test was performed on MW-9 to observe the relationship between pumping rate and drawdown to help determine proper pumping rates for a subsequent aquifer test. A 2 H.P. Goulds submersible pump (Model UTM20412), which was set at a depth of 65 feet, was pumped at rates between 21 and 38 gallons per minute (gpm) for 110 minutes. Drawdown in MW-9 was monitored with a wire line (conductivity-based) water level indicator. A rotometer was used to monitor discharge from the pump. Appendix C contains all data obtained from this test.

On August 29, 1985, a constant discharge test was performed on MW-9; MW-4, MW-8, and MW-10 were used as observation wells. Although the proposal by J. H. Kleinfelder & Associates [6] states that the test would be conducted for 24 hours, pumping (at 25.4 gpm) was terminated after 4 hours, 10 minutes because "the discharge started to decrease due to the increasing head in the storage tank and as a result of the pump overheating." The consultant states that this was enough time to achieve near steady state conditions. SWRCB staff attempted to plot the pump test data, but concluded that there were not enough points to determine a graphical analysis.

The plotted time-drawdown data from MW-4, MW-8, and MW-10 were analyzed by Theis curve matching and Jacob-Cooper approximation. On the basis of the calculated storage coefficients (0.0061 to 0.018), owner/operator's consultant concluded that the wells are screened in a confined aquifer. The Task Force has also plotted this data and has concluded that this is not evidence of a confined aquifer; the values are too high for a confined aquifer.

3.3 Ground Water Monitoring System

On May 18, 1984, RWQCB staff requested information from the owner/operator concerning the status of ground water monitoring at the facility. Shortly thereafter, both the RWQCB and DHS were informed by the owner/operator that the facility had not installed a ground water monitoring system, although nearly 3 years had passed since DHS issued an ISD [1]. However, in response to the RWQCB inquiry letter, the owner/operator agreed to submit a proposal to bring the facility into compliance.

On July 2, 1984, the owner/operator submitted the requested proposal [4] to the RWQCB for review and approval. However, this proposal was no more than a modified version of an earlier plan prepared by J. H. Kleinfelder & Associates for the installation of an underground storage tank monitoring system.

Nevertheless, joint RWQCB/DHS comments on the proposal were sent to the owner/operator in September 1984. In response, a more detailed proposal [5] for the installation of four ground water monitoring wells was submitted on November 28, 1984. This so-called "revised" proposal was conditionally approved by the RWQCB Executive Officer on December 11, 1984. One of the conditions imposed by the RWQCB was the installation of three additional monitoring wells.

As of this date 13 monitoring wells are in place; however the number, location, and depth of these wells is inadequate to determine the extent of contamination from Pond 1.

3.3.1 Detection Monitoring System

During January 1985, the following seven (7) ground water monitoring wells were installed for detection monitoring purposes:

Well Number	Drilling Period	Depth of Borehole	Depth of Well
MW-1	01/07-08/85	80.0	62.5
MW-2	01/10-18/85	95.0	75.0
MW-3	01/16-21/85	75.0	75.0
MW-4	01/16-22/85	75.0	75.0
MW-5	01/15-21/85	75.0	75.0
MW-6A	01/16-22/85	45.0	30.0
MW-6B	01/22-22/85	80.0	77.5

Both MW-1 and MW-2 were installed as upgradient monitoring wells: MW-1 is located approximately 450 feet upgradient of the surface impoundment at the northeastern corner of the facility; MW-2 is located approximately 350 feet northeast of the surface impoundment along the northern boundary of the facility. According to facility representatives, MW-3 was installed to obtain water quality data near the location of sewer leaks which have occurred at the facility. MW-4 was placed immediately downgradient of Pond 1 to detect any leaks. MW-5 was installed as a downgradient well at the extreme southwest corner of the property adjacent to the facility laboratory. Also according to facility representatives, MW-6A was installed to obtain ground water quality data near two former copper-sulphate ponds. MW-6B was installed to determine the amount of chemical attenuation through the 15-foot clay zone beneath the Gage Aquifer.

On June 13, 1985, the owner/operator submitted a report [6] describing the installation of the ground water monitoring system. On the basis of analytical results presented in the report, the consultant recommended the implementation of a ground water quality assessment program.

3.3.2 Assessment Monitoring System

On June 14, 1985, the owner/operator submitted an undated work plan [7] to install an assessment monitoring system.

Well Number	Drilling Period	Depth of Borehole	Depth of Well
MW-4A	07/10-XX/85	110.0	107.0
MW-7	07/08-XX/85	75.0	75.0
MW-8	07/12-XX/85	75.0	71.0
MW-9	07/10-XX/85	77.0	77.0
MW-10	07/10-XX/85	75.0	75.0
MW-11	07/08-XX/85	76.5	75.5

MW-11 was located approximately 200 feet north of the surface impoundment and approximately 150 feet west of the MW-2. According to the facility this well represents a third background water quality well. MW-4A was installed as a deep well immediately downgradient of the surface impoundment in an effort to define the vertical extent of the contamination. MW-7 was installed along the southern boundary of the facility to determine whether off-site migration was occurring. MW-8 was installed to define the horizontal extent of contamination near the surface impoundment in relation to other possible sources of contamination, including nearby underground storage tanks. MW-9 and MW-10 were installed near an abandoned underground sump which was reportedly located at the center of the facility.

Figure 5 shows the locations of the 13 existing ground water monitoring wells.

3.3.3 Well System

In the approved proposal by J. H. Kleinfelder & Associates [6], the first six boreholes were to be drilled with a truck-mounted, continuous-flight, hollow stem auger either to the base of the Gage Aquifer or 20 feet into ground water. Alleged difficulties during drilling brought about a modification to this procedure in which drilling deeper than 45 feet at all wells was supposedly done with mud rotary equipment. However, available information suggests that the following sequence of events actually took place:

- MW-1 - drilled to 80' with 8" HSA/redrilled to 80' with 10" HSA
- MW-2 - drilled to 95' with 8" HSA
- MW-5 - drilled to 75' with 8" HSA

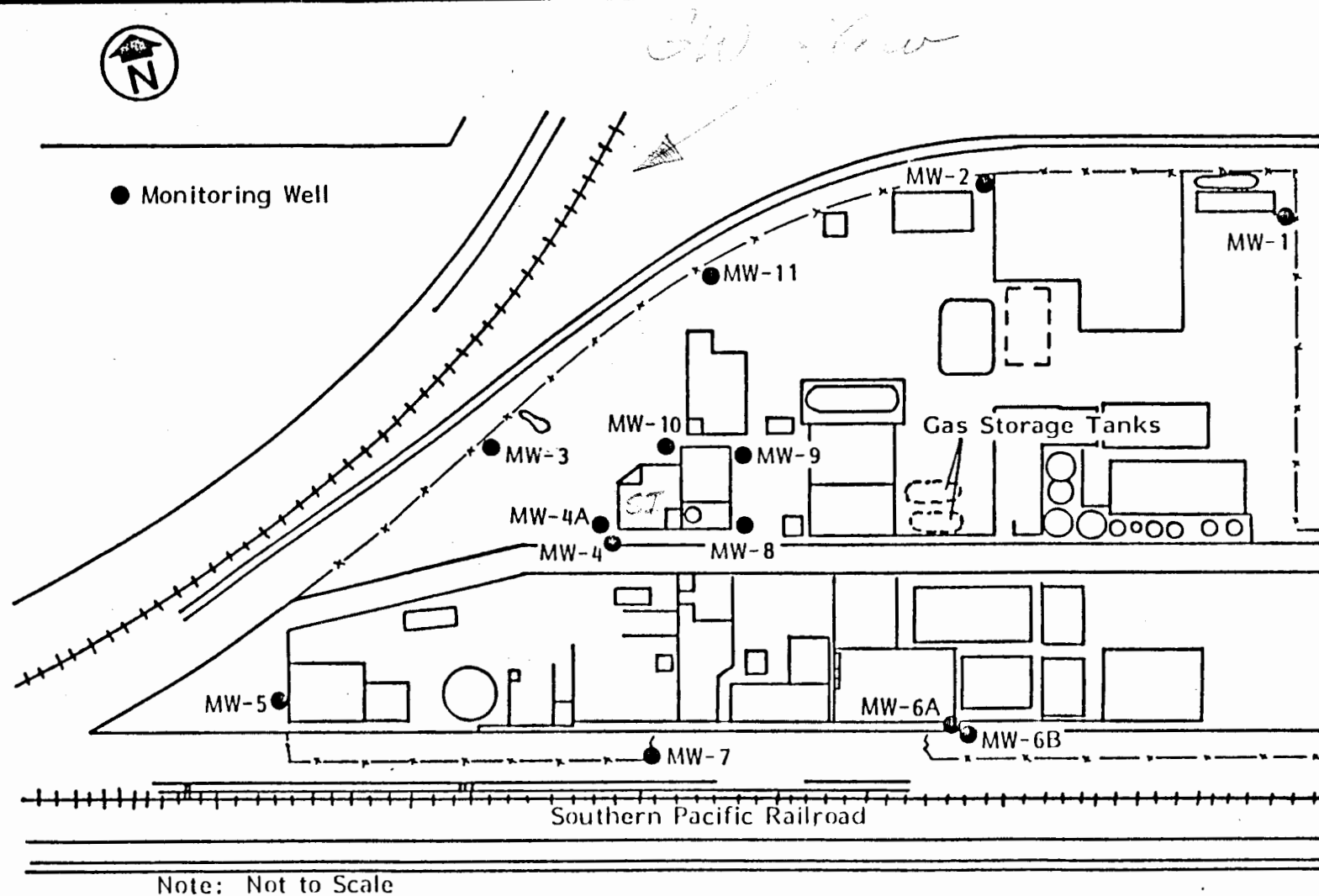


Figure 3. LOCATIONS OF MONITORING WELLS AT SOUTHERN CALIFORNIA CHEMICAL, INC.

MW-3 - drilled to 75' with 8" HSA
 MW-4 - drilled to 75' with 8" HSA
 MW-6A - drilled to 45' with 8" HSA
 MW-2 - redrilled to 75' with 7-5/8" rotary equipment
 MW-6B - drilled from surface to 80' with 7-5/8" rotary equipment

 MW-7 - drilled to 75' with 8" HSA
 MW-11 - drilled to 76.5' with 8" HSA?
 MW-9 - drilled to 77' with 8" HSA? (4" well)
 MW-10 - drilled to 75' with 8" HSA?
 MW-4A - drilled to 110' with 8" HSA? (4" well)
 MW-8 - drilled to 75' with 6" HSA

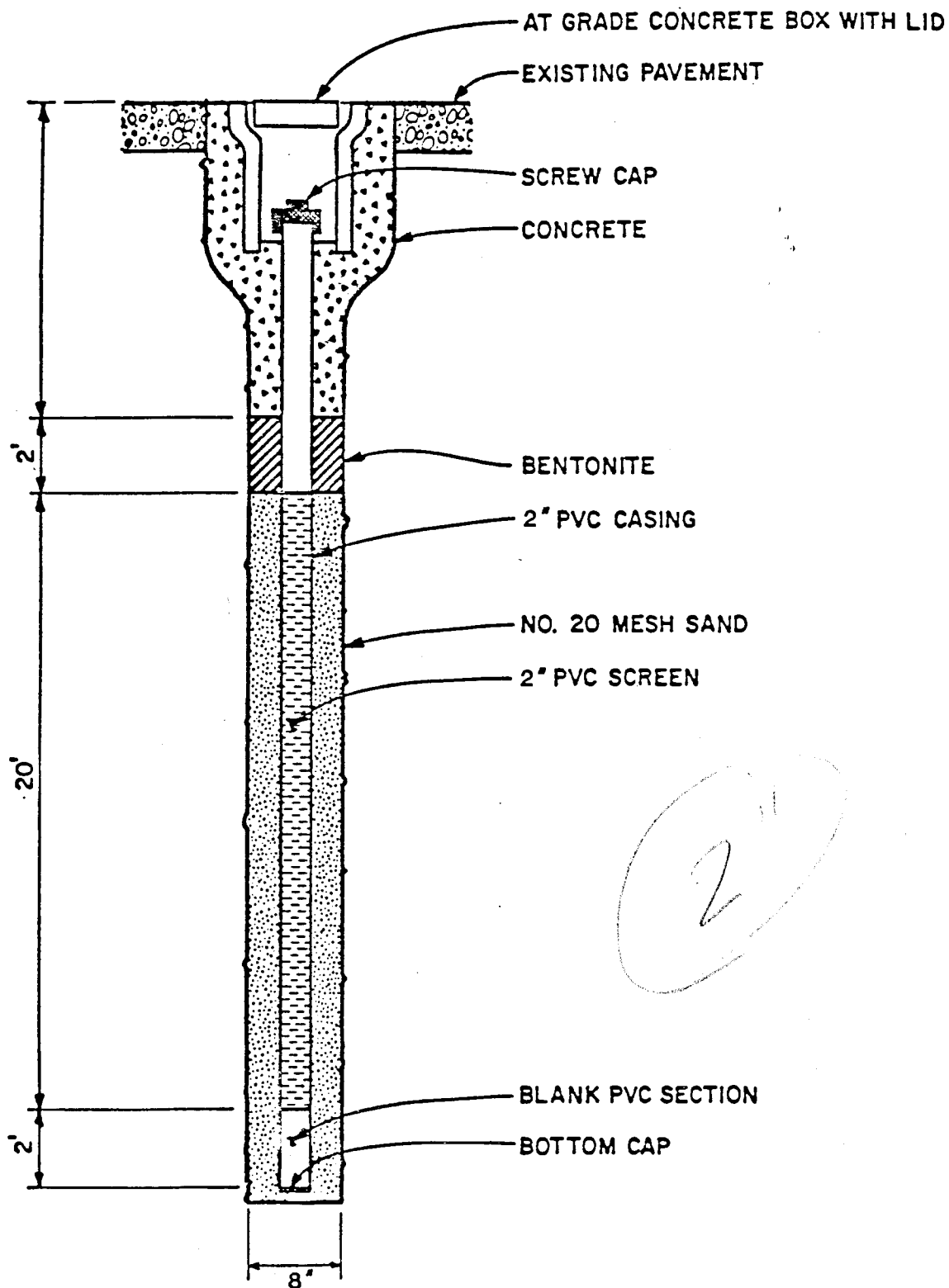
HSA? - The drill logs did not specify what type of drilling equipment was used to drill these bore holes.

Appendix D contains copies of 13 lithologic logs drafted by the consultant subsequent to drilling (in some cases, these logs were not drafted until five months after drilling). Copies of the boring logs actually prepared in the field can be found in the final "environmental assessment" report submitted by J. H. Kleinfelder & Associates [9].

Prior to any on-site drilling, the ground water monitoring wells were "designed" by J. H. Kleinfelder & Associates [5] on the basis of the company's "considerable work with the Gage Aquifer in the local area." (Emphasis added) Kleinfelder further states that "optimum well design for 2-inch monitoring wells consists of 0.020 inch factory slotted well screen and a No. 3 to No. 20 mesh sand ("Monterey Sand") filter pack." [5] No documentation is provided to substantiate that the hydrogeologic characteristics of the Gage Aquifer can be used to design monitoring wells installed in any other aquifer (12 of the 13 wells were completed in another aquifer). No mention is made of the "design" criteria for the two 4-inch monitoring wells (i.e., MW-4A and MW-9).

J. H. Kleinfelder & Associates has submitted several different "well configuration" diagrams as examples of how monitoring wells are constructed by the company. Of the 13 ground water monitoring wells, 11 are 2-inch diameter wells (Figure 6) and two are 4-inch diameter wells (Figure 7). However, the original drill logs indicate that none of the wells were constructed according to the "typical" well construction diagram, as explained below:

1. Two feet of "blank PVC section", a sediment trap, was not used at the bottom of each well.
2. Two of the 2-inch diameter wells were not constructed in an 8-inch borehole (MW-1 and MW-8).
3. Neither of the two 4-inch diameter wells were constructed in a 10-inch borehole (MW-4A and MW-9).



NOT TO SCALE

Figure 6

20

J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING



2" PVC MONITORING WELL
TYPICAL WELL CONFIGURATION

PLATE

3

PREPARED BY:

DATE:

CHECKED BY:

DATE:

PROJECT NO.

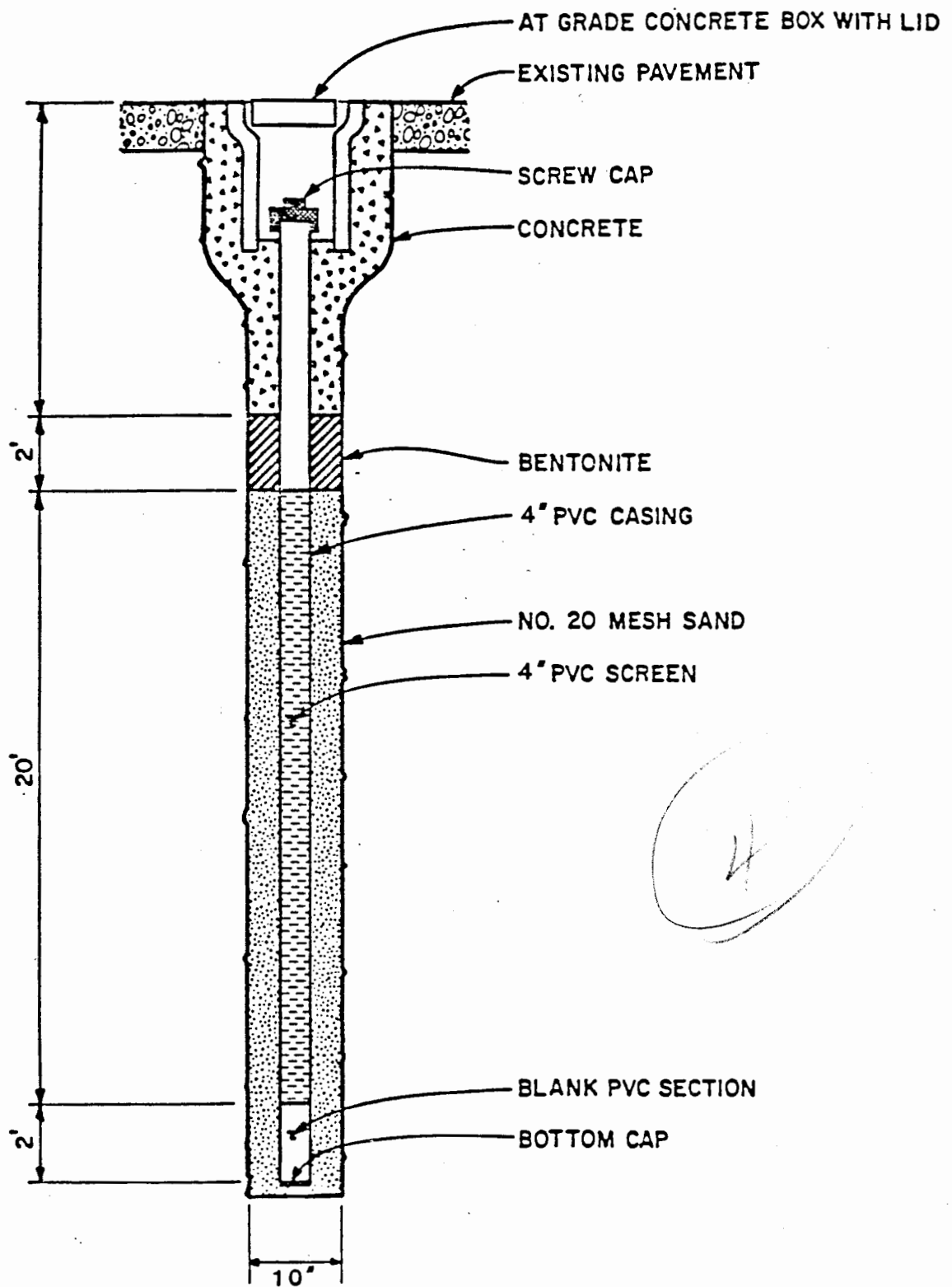


Figure 7

21

PLATE

J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING



4" PVC MONITORING WELL
TYPICAL WELL CONFIGURATION

4

PREPARED BY: DATE:

CHECKED BY: DATE:

PROJECT NO.

4. None of the wells were constructed so that the top of the filter pack would coincide with the top of the well screen (Table 4).
5. Only four of the wells have 20 feet of screen (MW-1, MW-4A, MW-6A, MW-11), all other wells have 30 feet of screen.
6. Two of the wells have a 1-foot bentonite seal (MW-1, MW-9), MW-8 has a 3-foot "clay" seal, and MW-11 has a 2-foot "clay" seal. MW-4A has no seal (Table 4).

Table 4

Well Screen vs. Sand Pack Construction

Well #	Sand Pack Above Top of Screen	Sealed With
1	-4.5'*	1' bentonite
2	8'	2' bentonite
3	3'	2' bentonite
4	2'	2' bentonite
4A	10'	not sealed
5	3'	2' bentonite
6A	2'	2' bentonite
6B	2.5'	2' bentonite
7	3'	2' bentonite
8	3'	3' "clay"
9	8'	1' bentonite
10	2'	2' bentonite
11	2.5'	2' "clay"

* The sand pack ended 4.5' below the top of the well screen. Then caved material was present until 1.5' above the top of the well screen.

7. Three of the wells have fill or caved material that effectively lengthens the screen interval (MW-1, MW-2, MW-6A).
8. Well Ex-1, drilled to a depth of 76 feet, is not addressed in any submitted report except for an incomplete drill log.

3.3.4 Sampling and Analysis Program

Federal regulations require a Sampling and Analysis Plan (SAP) which sets forth the procedures and techniques for sampling, shipping, and analyzing ground water samples [40 C.F.R. Part 265.92(a)]. In the original proposal by J. H. Kleinfelder & Associates [5], it is stated that a SAP would be prepared. To date, however, a formal SAP has not been submitted.

Appendix A of the assessment monitoring work plan by J. H. Kleinfelder & Associates [7] contains the only discussion of ground water sampling procedures. A 4 page section of Appendix A of the Work Plan [7] is being used as a sampling and analysis plan. It details the equipment to be used for sampling and purging of the wells and decontamination between wells. It indicates that a chain-of-custody procedure will be used and briefly discusses quality control. It addressed duplicate samples, split samples, and cross contamination. No other procedures such as recording of well depth, problems encountered, specific sampling techniques, preservation, and methods of analysis were addressed. Methods of analysis are reported in the quarterly monitoring reports submitted by the owner/operator. During the visual site inspection, well purging and sampling were done with a silicon bladder pump. A minimum of five well volumes of water was purged prior to sampling. As the wells were purged, temperature, pH, and conductivity measurements were taken. The facility representatives stated that meter calibration was done once in the morning. Nancy Ball of the DHS Hazardous Materials Laboratory in Berkeley noted that "calibration should be performed periodically throughout a sampling day, not just once in the morning." Sampling procedures are not stated in the "Sampling and Analysis Plan" and several sampling problems were noted by Nancy Ball during the site inspection:

- Refers to 4 page section?*
1. The frequency of glove changes when sampling, should occur more often.
 2. Field notes should be written during all phases of the sample collection and should be kept in a bound note book.
 3. Provisions should be made to sample for floaters and sinkers.
 4. Decontamination procedures observed did not follow standard laboratory procedures. The correct procedures usually involve cleaning with a non-phosphate detergent and rinsing with Type II purified water.
 5. Head space was not eliminated in the TOX and TOC containers.

In the environmental reports by J. H. Kleinfelder & Associates [6, 8, and 9], the consultant states that a "chain-of-custody form was maintained for all samples taken." This is the only

*Information available on chain-of-custody procedures, and the
responsibilities of the sampler, the shipper, and the
laboratory representative authorized to receive the samples are
never discussed. However, during the visual site inspection, it
was observed that ground water samples were sealed correctly,
sample analysis request forms were filled out, and standard
chain-of-custody procedures were followed. One exception was in
the labeling of sample bottles. Although the bottles were
labeled with a Brown and Caldwell label, the samples were sent to
Analytical Technologies, Inc. of San Diego.*

The October 1987 Quarterly Sampling Report by J. H. Kleinfelder & Associates contains the most recent information concerning the analytical methods used by both Brown and Caldwell Laboratories and Analytical Technologies. However, it appears that the responsibility for selecting these methods is given to the laboratory, rather than the sampler (chain-of-custody records do not specify the specific EPA method to be used). When the sample results of samples taken during the site inspection were returned to the facility, contamination level differences were noted. Since Analytical Technologies was a new laboratory, both laboratory procedures were reviewed and it was discovered that Brown and Caldwell had been decanting metal samples before analysis instead of resuspending the solids of the metal samples; the correct procedures according to Nancy Ball.

The sampling procedures as outlined in J. H. Kleinfelder & Associates Work Plan [7] are not adequate in lieu of a formal sampling and analysis plan. According to Nancy Ball, among other procedures, a sampling and analysis plan should additionally include:

1. A table listing container type and volume, preservative and special handling requirements, analytical methods, shipping information, and holding times for each parameter to be analyzed for.
2. The sampling plan should include a section on site history and background and a detailed description of each monitoring well including dimensions, casing type, screened interval, etc.
3. The sampling plan should include a QA/QC section which satisfies the requirements listed in SW-846. The frequency of field duplicates, field spikes, performance evaluation samples, field blanks, equipment blanks, etc., should be described. The criteria to be used for the acceptance of data should also be listed.

3.4 Ground Water Quality

The initial results, March 1985, of ground water sampling indicated that ground water beneath the facility was contaminated. The analysis of split samples collected by RWQCB staff substantiated the high levels of chromium (500mg/L) and lower levels of cadmium (.78 mg/L) and zinc (.06 mg/L) in MW-4. On the basis of these data, the owner/operator concluded that the uppermost aquifer beneath the facility had been impacted.

Elevated levels of hexavalent chromium have been detected in MW-4 and MW-9. In MW-4, chromium was originally detected at 500 mg/L; since that time (March 1985), the levels have fluctuated between 61 mg/L and 550 mg/L. The most recent analysis (October 1987) detected 190 mg/L. Figure 8 shows how the chromium contamination in MW-4 has changed with time. Figure 9 shows the fluctuations in water levels beneath the facility. A comparison of these seems to indicate that the concentration fluctuates with the ground water levels.

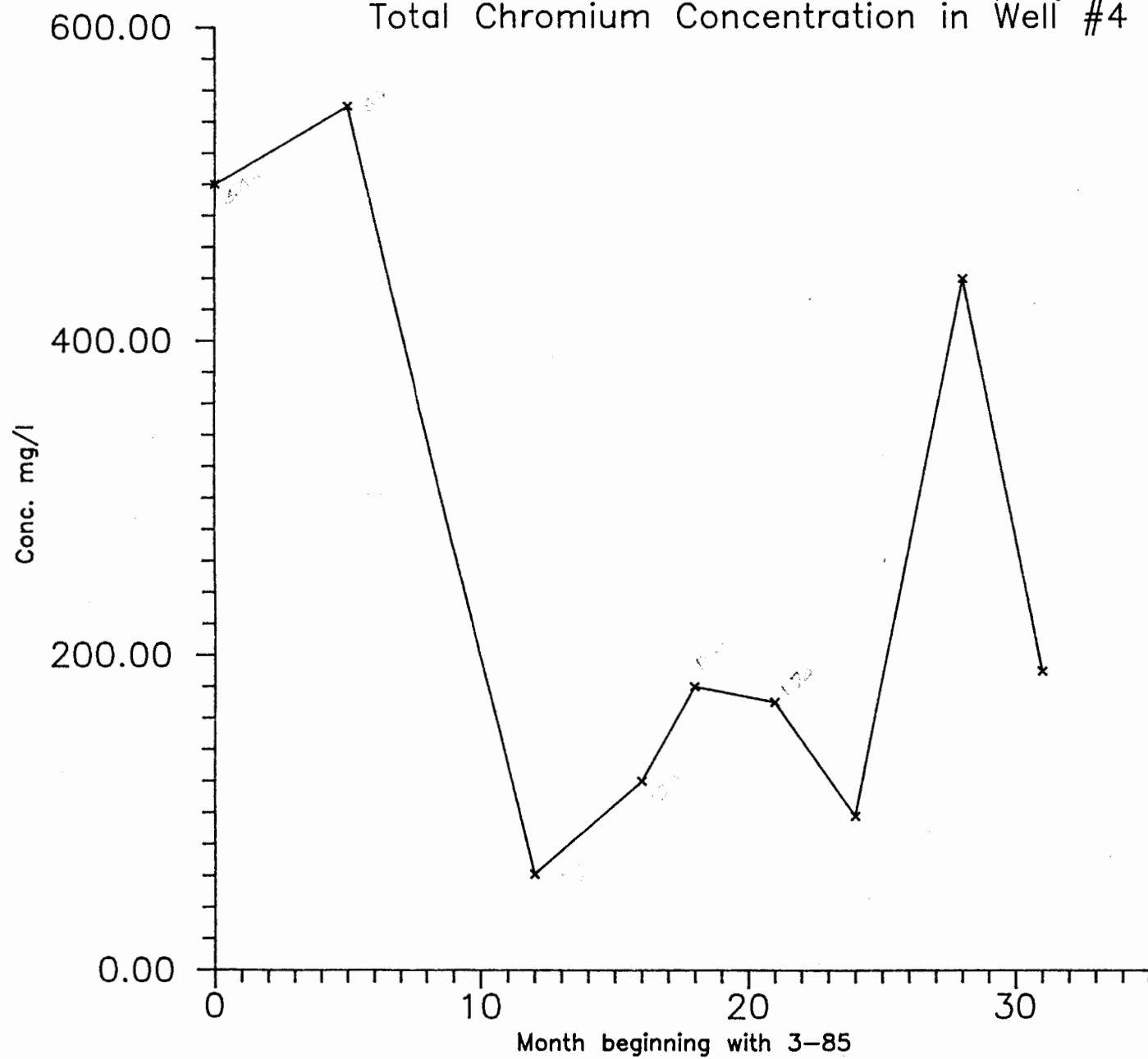
MW-9 currently has 0.84 mg/L of chromium.

In March 1985, cadmium was detected at a concentration of 0.78 mg/L in MW-4. In October 1987, cadmium was detected at 0.33 mg/L. MW-4 is the only well with detectable levels of cadmium.

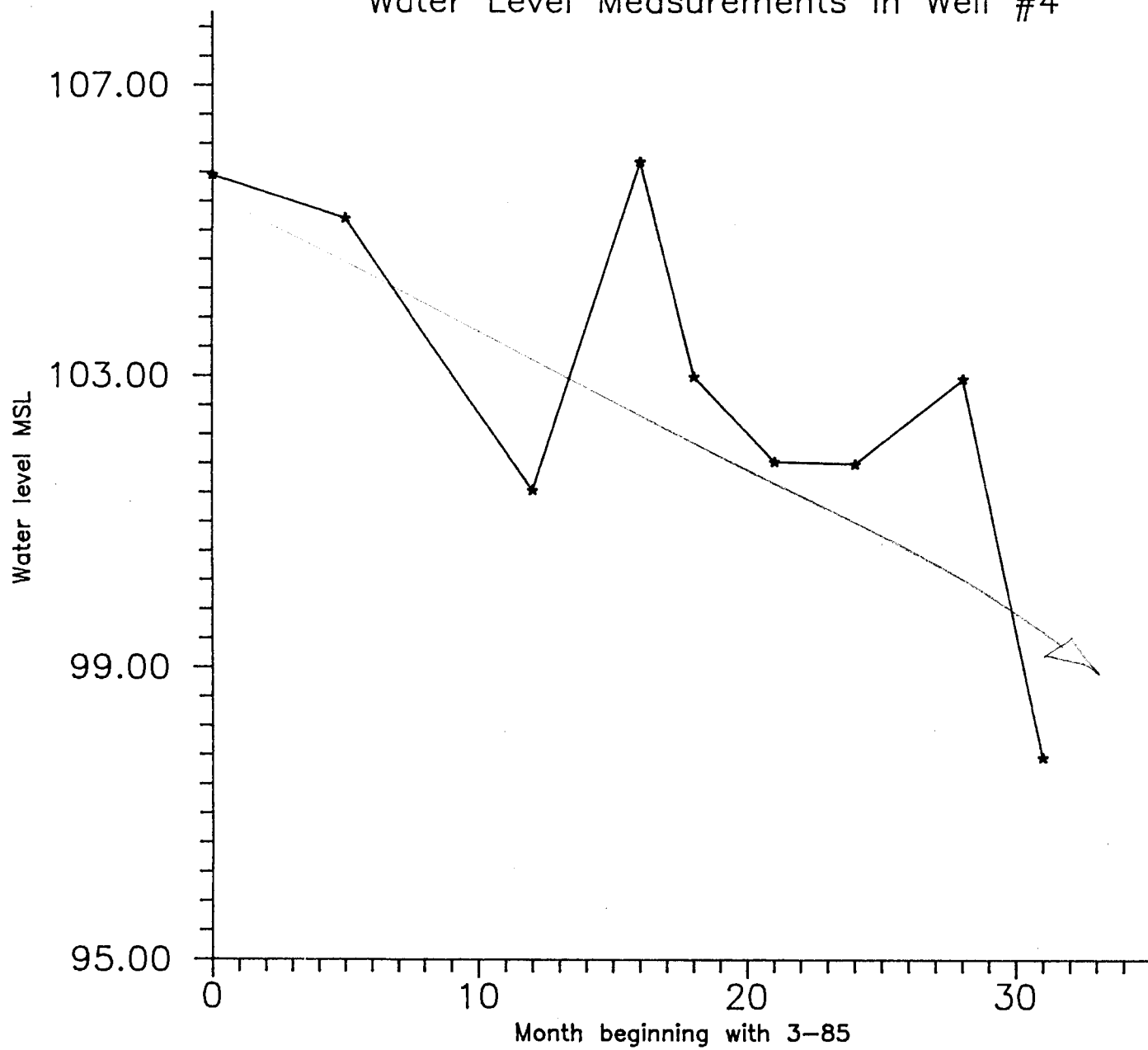
Even though MW-4 is immediately downgradient of Pond 1, the owner/operator claims that the source of chromium contamination is from an underground tank that was removed some time in the past. The underground tank was supposed to have been in an area slightly upgradient from Pond 1. However, the owner/operator has been unable to provide any evidence that this tank existed.

In March 1986, the owner/operator began submitting quarterly monitoring reports. These reports contain data which indicate that wells, both upgradient and downgradient of Pond 1 and the alleged underground tank area, are contaminated by volatile organic constituents. Ground water samples from MW-3, MW-4, MW-10, and MW-11 contain volatile organic compounds. According to the owner/operator only inorganic chemicals have been used at the facility and it is the opinion of the owner/operator that the volatile organic compounds detected are coming from an off-site source.

Southern California Chemical Company
Total Chromium Concentration in Well #4



Southern California Chemical Company
Water Level Measurements in Well #4



4.0 REFERENCE DOCUMENTS

1. California Department of Health Services; Interim Status Document #CAD008488025, 16 December 1981, 23 p.
2. California Department of Water Resources; Bulletin 104 Appendix A, June 1961, 181 p.
3. Regional Water Quality Control Board; Comprehensive Ground Water Monitoring Evaluation at Southern California Chemical Company, 25 June 1986, 9 p.
4. J. H. Kleinfelder & Associates; Revised Proposal For Environmental Studies, Southern California Chemical Co., Inc., Santa Fe Springs, California, 13 June 1984, 5 p.
5. J. H. Kleinfelder & Associates; Revised Proposal For Environmental Studies, Southern California Chemical Co., Inc., Santa Fe Springs, California, 26 November 1984, 13 p.
6. J. H. Kleinfelder & Associates; Environmental Monitoring Study, Southern California Chemical Co., Santa Fe Springs, California, June 1985, 20 p.
7. J. H. Kleinfelder & Associates; Work Plan for Assessment Phase, Southern California Chemical Company, (no date) 16 p.
8. J. H. Kleinfelder & Associates; Hydrogeologic Assessment of Pond Number 1, Southern California Chemical Co., Inc., Santa Fe Springs, California, 24 October 1985, 18 p.
9. J. H. Kleinfelder & Associates; Environmental Assessment, Southern California Chemical Co., Inc., Santa Fe Springs, California, March 1986, 28 p.
10. A. T. Kearney, Inc., and Science Applications International Corporation; RCRA Facility Assessment, Southern California Chemical Company, Inc., Santa Fe Springs, California, September 1987, 97 p.
11. Southern California Chemical Company, Inc.; (no title), 30 July 1985, 8 p.
12. Targee, Inc.; Workplan, Closure/Post-Closure, Pond Number 1, Southern California Chemical Company, Santa Fe Springs, California, (no date) 14 p.

APPENDIX A

**REVIEW OF HYDROGEOLOGIC REPORT AND WRITTEN
GROUND WATER MONITORING PROGRAM**

Appendix A

REVIEW OF HYDROGEOLOGIC REPORT AND WRITTEN GROUND WATER MONITORING PROGRAM

Company Name Southern California Chemical Co. EPA ID No. CAD008488025Company Address 8851 Dice RoadDate 1-8-88 / 5-20-88Santa Fe Springs, CA 90670Reviewer's Name Athar Kahn /Geologic Consultant J.H. Kleinfelder & Assoc. CME Task ForceConsultant's Address 17100 Pioneer BlvdReviewer's Civil Service
Classification Sanitary Eng.Artesia, CA 90701

Associate

Type of Facility	Number of Each				Liner Types
	Lined	Liner Type	Unlined	Double Lined	
(a) Surface Impoundment	_____	(see comment)	_____	_____	_____
(b) Landfill	_____	_____	_____	_____	_____
(c) Land Treatment Facility	_____	_____	_____	_____	_____
(d) Disposal Waste Pile	_____	_____	_____	_____	_____
			<u>Yes</u>	<u>No</u>	<u>Unknown</u>

For all double-lined facilities:

N/A

Is there a leak detection system?

Has leakage ever been detected?

If yes to above, describe

	<u>Yes</u>	<u>No</u>	<u>Unknown</u>
1. Has the owner/operator (O/O) conducted a hydrogeologic assessment of this site?	<u>X</u> *	—	—
2. Has O/O identified the uppermost aquifer?	—	<u>X</u> *	—
3. Are there other aquifers that may be hydraulically interconnected?	<u>X</u> *	—	—
4. Are these other aquifers identified?	<u>X</u> *	—	—
5. Does O/O have enough information to provide a reasonable understanding of the site's subsurface and to support the placement of wells capable of determining the facility's impact on the uppermost aquifer?	—	<u>X</u> *	—
6. Did the O/O use appropriate techniques to collect and interpret the information used to support well placement?	—	<u>X</u> *	—
7. If yes to question 6, what techniques were used?	<u>N/A</u>		
<hr/>			
8. Is the site being monitored at this time?	<u>X-quarterly</u>		—
9. Is the site being monitored under detection, assessment, or corrective monitoring?	<u>Assessment Monitoring</u>		
10. Does the facility have a ground water assessment program outline?	<u>X-Work Plan (Jun 85)</u>		
11. Does the outline contain all of the elements necessary to determine the rate, nature, and extent of any leaks?	—	<u>X</u> *	—
12. Was the hydrologic assessment report written by a qualified geologist?	<u>X</u>	—	—
13. Was the report accompanied by adequate support data, including:			
Drill Logs	<u>X</u> *	—	—
Geologic Maps	—	<u>X</u> *	—

* See comment. Comment number corresponds to question number.

	<u>Yes</u>	<u>No</u>	<u>Unknown</u>
Topographic Map(s)	—	<u>X*</u>	—
Cross Sections	—	<u>X</u>	—
Referenced Literature	<u>X</u>	—	—
Other (list <u>Fence Diagram</u>)	<u>X</u>	—	—
14. Was the boring program adequate to meet your evaluation needs?	<u>X</u>	—	—
15. Was the number of cross sections adequate?	<u>X-7 cross sections</u>	—	—
16. Were the cross sections adequately detailed and at a scale that shows geologic features beneath the facility that affect the integrity of each waste management area?	—	<u>X*</u>	—
17. Were the details on the cross sections corroborated by adequate support data?	—	<u>X*</u>	—
18. Have ground water flow directions been determined?	<u>X*</u>	—	—
19. Was flow direction determined on basis of piezometric data?	—	<u>X*</u>	—
20. Was there evidence of a vertical gradient?	—	—	<u>X*</u>
21. Was there mixing of data from wells and piezometers?	—	<u>X*</u>	—
22. Were O/O conclusions about flow direction demonstrated with support?	—	<u>X*</u>	—
23. If piezometers were used, what was screen length?	<u>N/A</u>	—	—
24. How many piezometers were used?	<u>N/A</u>	—	—
25. What was depth of piezometers?	<u>N/A</u>	—	—
26. Is there a rationale presented for the location and depth of each piezometer?	<u>N/A</u>	—	—
27. Did the O/O determine the hydraulic conductivity?	—	<u>X*</u>	—

	Yes	No	Unknown
28. What was method used to determine hydraulic conductivity?		*	
29. Was the method used to determine hydraulic conductivity fully demonstrated with support data, including drawdowns, well layout(s), curve match points or straight line segments used, quantities of water injected or withdrawn and rate?		X*	
30. Provide values determined for:			
Transmissivity <u>32,057 to 44,694 gpd/ft*</u>			
Storage Coefficient <u>.0061 to .018</u>			
Leakage <u>not addressed</u>			
Hydraulic Conductivity <u>not calculated</u>			
31. Were sufficient hydraulic conductivity determinations made to document lateral and vertical variation in hydraulic conductivity in the entire subsurface below the site?		X*	
32. Are there as built of all monitor wells and piezometers?	X*		
33. Did the O/O construct a flow net of the ground water movement on his site?		X*	
34. Are there variations in flow direction due to:			
Intermittent pumping of nearby wells?			X*
Seasonal variations?	X		
Tidal or other variations?		X	
35. How many upgradient wells have been constructed?			4-MW1, MW2, MW9, MW11*
36. Is this an adequate number based on data in the hydrogeologic report?	X*		
37. How many downgradient wells have been constructed?			4-MW4, MW4A, MW5, MW7*

	<u>Yes</u>	<u>No</u>	<u>Unknown</u>
38. Is there a rationale presented for the location of each monitoring well?	—	<u>X</u> *	—
39. Is this an adequate number of down-gradient wells on the basis of the hydrogeologic report?	—	<u>X</u> *	—
40. Are there wells at the compliance point?	—	<u>X</u> *	—
41. Are the downgradient wells located properly to intercept leakage?	—	<u>X</u> *	—
42. Are the wells screened in the uppermost aquifer?	<u>X</u> *	—	—
43. Are the wells screened at intervals where contaminants would be expected?	—	—	<u>X</u> *
44. What is the screen length of wells?	<u>15 to 35 feet</u>		
45. What was the method used to drill the wells?	<u>hollow stem auger, mud rotary*</u>		
46. What was the method used to develop the wells?	<u>airlift with a foot valve</u>		
47. Are the wells sealed?	<u>X</u>	—	—
48. What is the sealant material?	<u>cement & bentonite</u>		
49. Is there a seal between the filter pack and the cement?	<u>X</u> *	—	—
50. If the seal between the filter pack and the cement is bentonite, what is the size of the particles? (½" pellets, ¾" pellets, coarse grit).	<u>unknown, not addressed</u>		
51. Is the bentonite described in 50 above the water table?	<u>X-except 4A</u>		
52. What is the casing material?	<u>NSF rated PW PVC</u>		

	<u>Yes</u>	<u>No</u>	<u>Unknown</u>
53. What is the screen material?	<u>NSF rated PW PVC with .02" machine slots</u>		
54. Is there evidence of the methods used to select filter pack and screen slot size?	<u> </u>	<u>X*</u>	<u> </u>
55. Is the filter pack appropriate for the aquifer in which it is placed?	<u> </u>	<u> </u>	<u>X*</u>
56. What is the size of the annular space?	<u>Work Plan indicates 3"*</u>		
57. Is the screen slot size appropriate for the filter pack used?	<u>X</u>	<u> </u>	<u> </u>
58. Is there a written sampling and analysis plan?	<u>X*</u>	<u> </u>	<u> </u>
59. Does the sampling and analysis plan provide for:			
<u>Work Plan (Jun 85)</u>			
Written procedures for purging wells?	<u>X*</u>	<u> </u>	<u> </u>
Providing clean equipment for sampling each well?	<u>X</u>	<u> </u>	<u> </u>
Are the sampling materials specified appropriate to the waste types being monitored?	<u>X*</u>	<u> </u>	<u> </u>
What sampling equipment and materials are specified?	<u>air activated pump (bladder pump),</u>		
	<u>teflon sampler lines, wire line level indicator</u>		
Avoidance of contamination of equipment transported to each location?	<u>X</u>	<u> </u>	<u> </u>
Measuring water levels?	<u>X</u>	<u> </u>	<u> </u>
Recording water levels?	<u>X</u>	<u> </u>	<u> </u>
Recording depth of well?	<u> </u>	<u>X*</u>	<u> </u>
Recording any problems encountered at each well?	<u> </u>	<u>X*</u>	<u> </u>
Measuring pH and specific conductivity in the field?	<u>X</u>	<u> </u>	<u> </u>

	<u>Yes</u>	<u>No</u>	<u>Unknown</u>
Collecting samples of ground water without degassing of volatile organics?	—	<u>X</u> *	—
Use of appropriate equipment?	<u>X</u>	—	—
Use of blanks, spikes, etc.?	<u>X</u>	—	—
Details of sample preservation?	—	<u>X</u> *	—
Methods of analyses to be used?	—	<u>X</u> *	—
60. Have comparisons of ground water contamination indicator parameters for upgradient well(s) shown a significant increase (or pH decrease) over initial background?	—	<u>X</u> *	—
61. Have comparisons of indicator parameters for downgradient wells shown a significant increase (or pH decrease) over initial background?	—	<u>X</u> *	—
62. If yes to 61, were additional ground water samples taken from those downgradient wells where the significant difference was determined?	<u>N/A</u>	—	—
63. If yes to 61, what was source of significant increase over initial background?	<u>N/A</u>	—	—
64. If yes to 61, has the O/O submitted an assessment program?	<u>N/A</u>	—	—
Has this program been approved?	<u>N/A</u>	—	—
65. Has O/O compared monitoring data collected downgradient to that from upgradient for a period of at least one year?	—	<u>X</u> *	—
66. Was it determined that hazardous waste or hazardous waste constituents from the facility have entered the ground water?	<u>X</u> *	—	—

	<u>Yes</u>	<u>No</u>	<u>Unknown</u>
67. If yes to above, has there been a determination of the rate of migration of hazardous waste or hazardous waste constituents from the facility?	—	<u>X*</u>	—
68. If yes to 67, list the constituents originating from the waste management area.	<u>N/A</u>		
69. List the wells which have shown statistically significant increases.	<u>N/A*</u>		
70. Were the significant increases in contaminant concentration determined through the use of the Student's t-test?	<u>N/A</u>	—	—
If no, which test was used?	—	—	—
Was this an appropriate test?	—	—	—
71. List the chemical and physical properties of the contaminants which have been detected in the ground water (density, solubility, etc.).	<u>*</u>		
72. Are there differences between up and downgradient wells which qualitatively suggest there may be a leak?	<u>X</u>	—	—
73. Has the O/O opted to know or assume there is a leak in lieu of performing a statistical test?	—	<u>X*</u>	—
74. List wells that show qualitative increases (or pH decrease) and parameters that are shown to increase (or decrease if pH).	<u>MW4, MW9</u>	—	—

	<u>Yes</u>	<u>No</u>	<u>Unknown</u>
75. Has the extent of the migration of hazardous waste or hazardous waste constituents been determined?	—	<u>X</u> *	—
76. If yes to above, list method used (additional monitor wells, geophysical methods, computer modeling, etc.).	<u>N/A</u>		
77. Are the locations of additional wells shown on the map?	<u>X</u> *	—	—
78. Are the locations of additional wells reasonable on the basis of the data provided?	—	<u>X</u> *	—
79. Are the depths of additional wells reasonable on the basis of the data provided?	—	—	<u>X</u> *
80. Is the ground water monitoring program described in the hydrogeologic assessment report adequate for this site?	—	<u>X</u> *	—
81. List dates of all quarterly, semiannual, and annual reports received.	<u>*</u>		
82. List dates of all incidents and incident reports received.	<u>not known</u>		
83. List any reports missing.	<u>4th quarter 1987</u>		
84. Have all reporting requirements been met?	—	<u>X</u> *	—

Comments for Appendix A

Pond 1 was a 36,000-gallon treatment pond constructed of 6" reinforced concrete. In 1985 pond use was discontinued. Subsequently, the pond was coated with asphalt and converted into a secondary spill containment for above-ground tanks.

1. During the first sampling of RCRA detection monitoring, Southern California Chemical Co. (SCCC) discovered chromium contamination and launched SCCC into assessment. J. H. Kleinfelder & Associates, a geologic consultant, has installed 13 monitoring wells and submitted an Assessment Report; however, this report does not adequately determine the depth and extent of contamination.
2. The owner/operator's (O/O) consultant reports the Gage Aquifer is the uppermost aquifer but is dry (however two water level readings were reported: 4/85 and 8/85) and that the Gage Aquifer is underlain by a silty clay layer (aquiclude) which is underlain by the Jefferson Aquifer. The owner/operator's consultant states that the Jefferson Aquifer is the uppermost water bearing aquifer beneath the site and all aquifer parameters, etc. refer to the Jefferson Aquifer. This stratigraphic sequence is inconsistent with DWR Bulletin 104 [2]. See sections 3.1 and 3.2 of the CME report.
3. The O/O's consultant states that the Gage Aquifer is dry and that the next lower aquifer, the Jefferson Aquifer, is the "uppermost water bearing formation". According to DWR Bulletin 104 there are three aquifers of significance that may be hydraulically interconnected below the site: Gage Aquifer, Hollydale Aquifer, and Jefferson Aquifer in increasing depth order.

The Gage and Jefferson Aquifers are addressed in the Assessment Report [9] as being separated by a 15- to 25-foot thick aquiclude. No other hydraulic interconnections were mentioned and no other aquifers were specifically mentioned.

4. The O/O's consultant states that the Gage Aquifer is dry and that the next lower aquifer, the Jefferson Aquifer, is the "uppermost water bearing formation". According to DWR Bulletin 104 there are three aquifers of significance that may be hydraulically interconnected below the site: Gage Aquifer, Hollydale Aquifer, and Jefferson Aquifer in increasing depth order.

The Gage and Jefferson Aquifers are addressed in the Assessment Report [9] as being separated by a 15- to 25-foot thick aquiclude. No other hydraulic interconnections were mentioned and no other aquifers were specifically mentioned.

5. Since the O/O has misidentified the stratigraphy beneath the site, the O/O does not have enough information to provide a reasonable understanding of the site's subsurface. Further, the O/O has misidentified the aquifer in which the monitoring wells were drilled so there is not enough information to support the placement of these wells.
6. The Assessment Report [9] does not support or discuss well placement; well placement was not based on an adequate site characterization. An adequate site characterization should also include an understanding of the subsurface, correctly identifying stratigraphy, the uppermost aquifer, hydraulically interconnected aquifers, vertical gradients, and hydraulic conductivity.
11. Well placement based on inadequate site characterization is not adequate to determine the rate, nature, and extent of any leaks.
13. Drill Logs: The drill logs drafted by the O/O's consultant do not contain all the information on the original drill logs. The original drill logs show caved materials, bentonite seals, and filled materials but there is no discussion of grain size, sorting, or type of materials these were. Also some wells were drilled to a depth and then filled in 10 feet or more. These procedures should be explained.
- Geologic Maps: A geologic map was not submitted.
- Topographic Maps: A topographic map was not submitted.
- Cross Sections: Geologic cross sections are hand drawn imprecisely and do not show detail. Cross section lines are not located on a map. The regional cross section submitted by the O/O's consultant is incorrectly taken from DWR Bulletin 104 [2] and applied to this site. Further, the consultant has mislocated the site on this cross section.
16. Geologic cross sections are hand drawn imprecisely and do not show detail. Cross section lines are not located on a map. The regional cross section submitted by the O/O's consultant is incorrectly taken from DWR Bulletin 104 [2] and applied to this site. Further, the consultant has mislocated the site on this cross section.

17. Cross sections were not detailed. Some stratigraphic horizons within a single boring were drawn at different thicknesses and depths on cross section lines. Cross sections were not corroborated by adequate support data.
18. Flow directions were not determined using piezometers and vertical gradients were not addressed.
19. Flow directions were not determined using piezometers.
20. Flow directions were not determined using piezometers and vertical gradients were not addressed.
21. All data was from wells.
22. Flow directions were determined using wells with different length screens.
27. O/O did not determine hydraulic conductivity.
28. O/O did not determine hydraulic conductivity, however two pump tests were performed to determine storage coefficients and transmissivity values.
29. O/O did not determine hydraulic conductivity.
30. Transmissivity was calculated using the Jacob-Cooper approximation. The Jacob-Cooper approximation requires that the aquifer be confined. The data from the pump tests suggest that this aquifer is not confined.
31. O/O did not determine hydraulic conductivity.
32. The as-builts drafted by the O/O's consultant do not contain all the information on the original drill logs and in one well did not show the proper screen interval. Some wells show caved material and fill material, but there is no discussion of what these materials were, their grain size, or sorting. Some wells were drilled to a depth and then filled in 10 feet or more. These procedures should be explained.
33. O/O did not construct a flow net.
34. There are 4 pumping wells within a 1 mile radius. Their effect on ground water flow was not addressed.
35. There are 4 upgradient wells - MW-1, MW-2, MW-9, MW-11. Only MW-1 is an adequate upgradient well. MW-2 is contaminated with organics and MW-9 is contaminated with chromium from a source other than Pond 1. MW-11 is not upgradient of the pond area. In addition, there are 5 wells neither upgradient nor downgradient that are in the vicinity of Pond 1 - MW-3, MW-6A, MW-6B, MW-8, MW-10.

36. There are 4 upgradient wells - MW-1, MW-2, MW-9, MW-11. Only MW-1 is an adequate upgradient well. MW-2 is contaminated with organics and MW-9 is contaminated with chromium from a source other than Pond 1. MW-11 is not upgradient of the pond area. In addition, there are 5 wells neither upgradient nor downgradient that are in the vicinity of Pond 1. MW-1 is sufficient for upgradient, background water quality.
37. There are 4 downgradient wells - MW4, MW4A, MW-5, MW-7. MW-7 is not an adequate downgradient well because it is not down gradient of Pond 1. MW-4, MW-4A, and MW-5 are spaced too far apart to adequately characterize any contamination from Pond 1.
38. The rationale presented for placement of wells is not based on adequate site characterization. See section 3.3.1 of the CME report.
39. There is not an adequate number of down gradient wells since MW-4, MW-4A, and MW-5 are spaced too far apart to adequately characterize contamination from Pond 1.
40. Since SCCC is currently being monitored under Assessment, compliance point is less relevant. However, well placement does not adequately characterize contamination from Pond 1 and is based on inadequate site characterization.
41. There are 4 downgradient wells - MW4, MW4A, MW-5, MW-7. MW-7 is not an adequate downgradient well because it is not down gradient of Pond 1. MW-4, MW-4A, and MW-5 are spaced too far apart to adequately characterize any contamination from Pond 1.
42. The uppermost aquifer has not been properly identified. The O/O's consultant claims the uppermost stratigraphic aquifer, the Gage Aquifer, is dry. However, two water level readings were reported 4-85 and 8-85. Further, the Hollydale Aquifer appears to be the uppermost aquifer rather than the Jefferson Aquifer.
43. There is not adequate site characterization to determine where contaminants would be expected.
45. In the O/O's approved proposal [6] all wells were to be drilled using a hollow stem auger. Alleged difficulties during drilling brought about a modification to this procedure in which drilling deeper than 45 feet at all wells was supposedly done with mud rotary equipment. However, available information suggests that a different sequence of events actually took place. See section 3.3.3 of the CME report.

49. A bentonite or "clay" seal 1- to 3- feet thick was used.
54. Methods used to select filter pack and screen slot size were not addressed.
55. No grain size analysis or other study of the screened aquifer was submitted that would indicate the appropriate filter pack.
56. In the Work Plan [7] 2" monitoring wells were to be drilled with an 8" hollow stem auger and 4" monitoring wells were to be drilled with a 10" hollow stem auger leaving a 3" annular space in all wells. However, available information suggests that a different sequence of events actually took place. See section 3.3.3 of the CME report.
58. There is no adequate sampling and analysis plan. A 4 page section of Appendix A of the Work Plan [7] is being used as a sampling and analysis plan. It details the equipment to be used for sampling and purging of wells and decontamination between wells. It indicates that a chain-of-custody procedure will be used and briefly discusses quality control. It addressed duplicate samples, split samples, and cross contamination. No other procedures such as recording of well depth, problems, specific sampling techniques, preservation, and methods of analysis were addressed.
59. There is no adequate sampling and analysis plan. A 4 page section of Appendix A of the Work Plan [7] is being used as a sampling and analysis plan. It details the equipment to be used for sampling and purging of wells and decontamination between wells. It indicates that a chain-of-custody procedure will be used and briefly discusses quality control. It addressed duplicate samples, split samples, and cross contamination. No other procedures such as recording of well depth, problems, specific sampling techniques, preservation, and methods of analysis were addressed.
- Plan does not provide for recording depth of well.
 - Plan does not provide for problems encountered.
 - Plan does not address sample collection procedures.
 - Plan does not address details of sample preservation.
 - Plan does not address methods of analysis.
60. Background has not been established. No comparisons have been made.

61. Background has not been established. No comparisons have been made.
65. Quarterly sampling reports have been submitted to the Regional Board since 1986 but no comparisons or statistical analyses have been done.
66. During the first sampling of RCRA detection monitoring SCCC discovered chromium contamination in two wells and launched SCCC into Assessment. The O/O has stated that the leak came from an old underground tank but they can not provide any records that prove the tank existed. One of the wells contaminated with the highest levels of chromium is immediately downgradient of Pond 1 which received chromium wastes.
67. Migration rates have not been addressed.
69. Quarterly sampling reports have been submitted to the Regional Board since 1986 but no comparisons or statistical analyses have been done.
71. Chromium, copper, and cadmium are the principal contaminants detected in the ground water. Some of the important properties related to water quality are as follows:

Chromium - Chromium has oxidation states ranging from Cr+2 to Cr+6; the trivalent form is found most commonly in nature. Chromium is slightly soluble in water.

Copper - Copper has a density of 0.322 lbs/in³ and a specific gravity of 8.91. Some copper salts are highly soluble in water.

Cadmium - Cadmium is less soluble in water but readily soluble in mineral acids.

73. During the first sampling of RCRA detection monitoring SCCC discovered chromium contamination in two wells and launched SCCC into Assessment. The O/O has stated that the leak came from an old underground tank but they can not provide any records that prove the tank existed. One of the wells contaminated with the highest levels of chromium is immediately downgradient of Pond 1 which received chromium wastes.

75. The extent of the migration of hazardous waste or hazardous waste constituents has not been determined.

77. Additional wells were drilled after the first sampling where contamination was found. The additional wells are included in the Assessment Report [9].

78. Well placement based on inadequate site characterization is not adequate to determine the rate, nature, and extent of any leaks.
79. Well placement based on inadequate site characterization is not adequate to determine the rate, nature, and extent of any leaks.
80. Well placement based on inadequate site characterization is not adequate to determine the rate, nature, and extent of any leaks. Also the sampling and analysis plan is inadequate.
81. - 1st Quarterly Sampling Report 1986
- 2nd Quarterly Sampling Report 1986
- 3rd Quarterly Sampling Report 1986
- 4th Quarterly Sampling Report 1986
- 1st Quarterly Sampling Report 1987
- 2nd Quarterly Sampling Report 1987
- 3rd Quarterly Sampling Report 1987
84. The 4th Quarter Sampling Report 1987 was not submitted as of this date.

Note: The following reports were used to complete Appendix A:
"Work Plan for Assessment Phase" submitted June 1985
"Assessment Report" submitted Mar 1986
"Appendices" submitted Mar 1986

APPENDIX B

**FIELD REVIEW OF HAZARDOUS WASTE DISPOSAL SITE
TO DETERMINE COMPLIANCE WITH GROUND WATER MONITORING REQUIREMENTS**

FIELD REVIEW OF HAZARDOUS WASTE DISPOSAL SITE
TO DETERMINE COMPLIANCE WITH GROUND WATER MONITORING REQUIREMENTS

Company Name Southern California Chemical Co. EPA ID No. CAD 008488025
 Company Address 8851 Dice Road Date 2-3-88 / 5-19-88
Santa Fe Springs, CA 90670 Reviewer's Name Athar Kahn /
 Geologic Consultant J.H. Kleinfelder & Assoc. CME Task Force
 Consultant's Address 17100 Pioneer Blvd Reviewer's Civil Service
Artesia, CA 90701 Classification Sanitary Eng. Assoc.

Type of Facility	Lined	Liner Type	Number of Each		
			Unlined	Double Lined	Liner Types
(a) Surface Impoundment	_____	(see comment)	_____	_____	_____
(b) Landfill	_____	_____	_____	_____	_____
(c) Land Treatment Facility	_____	_____	_____	_____	_____
(d) Disposal Waste Pile	_____	_____	_____	_____	_____
			<u>Yes</u>	<u>No</u>	<u>Unknown</u>

For all double-lined facilities:

Is there a leak detection system?	N/A	_____	_____	_____
Does the leak detection system currently have liquid in it?		_____	_____	_____
Is there any indication that leakage has occurred?		_____	_____	_____
If yes to above, describe		_____	_____	_____

	<u>Yes</u>	<u>No</u>	<u>Unknown</u>
1. Was the ground water monitoring program and geologic assessment report reviewed prior to site visit?	<u>X</u>	—	—
2. Has the ground water monitoring plan been implemented?	<u>X</u> *	—	—
3. Do the plans and descriptions provided in the geologic report accurately reflect:			
Site geology, including lithology, structure, primary and secondary permeability?	—	<u>X</u> *	—
Site topography?	—	<u>X</u> *	—
Current status of facilities?	—	<u>X</u> *	—
4. Is a regional map of the area, with the facility delineated, included in the report?	<u>X</u>	—	—
5. If yes, what is the scale?	<u>1" = 2000'</u>		
6. Is there a topographic map of the site at a scale of 1 inch = 200 feet that shows the topography and all units present at the facility?	—	<u>X</u> *	—
If not 1 inch = 200 feet, show scale.	<u>N/A</u>		
Show contour interval.	<u>N/A</u>		
7. Are there any streams, rivers, lakes, or wetlands near the facility?	<u>X</u>	—	—
8. If yes to above, list and give approximate distance and indicate apparent up- or downgradient direction.	<u>1. San Gabriel River - 1 mile downgradient to the west</u> <u>2. Sorensen Avenue storm drain - 1/4 mile upgradient to the northeast</u>		

* See comment. Comment number corresponds to question number.

	<u>Yes</u>	<u>No</u>	<u>Unknown</u>
9. Is there any evidence in these adjacent water bodies of contaminants coming from the facility?	—	<u>X</u> *	—
What is the evidence?	_____		
10. Are there any discharging or recharge wells near the facility?	<u>X</u>	—	—
11. If yes to above, list and give approximate distance and indicate apparent up- or downgradient direction?	_____*		
12. Is a site water table contour map included in the geologic report?	<u>X</u>	—	—
13. Does the contour map appear logical on the basis of topography and observed data?	<u>X</u>	—	—
14. Are static water levels shown?	<u>X</u>	—	—
15. Is at least one monitoring well located in the area that appears to be hydraulically upgradient?	<u>X</u>	—	—
16. List all upgradient wells by number	_____		
	MW-1, MW-2, MW-9, MW-11*		
17. Are at least three monitoring wells located in an area that appears to be hydraulically downgradient?	<u>X</u>	—	—
18. List all downgradient wells by number	_____		
	MW-4, MW-4A, MW-5, MW-7*		
19. Are there any seeps or wet areas downgradient of the facility?	—	<u>X</u>	—
20. Are there downgradient areas that appear to be in need of additional monitoring wells?	<u>X</u>	—	—
If yes, describe the locations.	_____*		

	<u>Yes</u>	<u>No</u>	<u>Unknown</u>
33. Was ground water encountered in all monitoring wells?	—	<u>X*</u>	—
34. List any wells which were dry.	<u>MW-6A*</u>		
<hr/>			
35. Are samples from any well turbid (where turbidity means fine material from the aquifer, not chemical or biologic reactions in the well)?	<u>X</u>	—	—
36. List wells that produce turbid samples?	<u>MW-3*</u>		
<hr/>			
37. What material (Teflon, stainless steel 316 or 304, PVC, etc.) was used in the construction of the well casing? Well screen?	<u>PVC</u> <u>.02" machine slotted PVC</u>		
38. Is there a copy of the sampling plan at the facility?	<u>X*</u>	—	—
39. Is the plan being followed in regard to:			
Sampling schedule?	<u>X</u>	<u>—*</u>	—
Sampling methods?	—	<u>X*</u>	—
Sample preservation	—	<u>X</u>	—
Sample handling?	<u>X</u>	<u>—*</u>	—
Sample analysis?	—	<u>X*</u>	—
Record keeping?	—	<u>X</u>	—
40. List any deviation from the sampling and analysis plan.	<u>—*</u>		
<hr/>			
41. Are organic constituents to be sampled?	<u>X</u>	—	—
42. Are samples collected with appropriate equipment and methods to minimize absorption and volatilization?	—	<u>X*</u>	—
43. Are appropriate sample preservation and preparation procedures being followed (filtration and preservation, as appropriate)?	—	—	<u>X*</u>

	<u>Yes</u>	<u>No</u>	<u>Unknown</u>
44. Are samples refrigerated?	<u>X</u>	—	—
45. Are Environmental Protection Agency (EPA) recommended sample holding period requirements being adhered to?	<u>X</u> - According to 0/0—		
46. Are suitable container types being used?	<u>X</u>	—	—
47. Is a chain of custody control procedure clearly defined?	—	<u>X</u> *	—
48. Is sample analysis performed by a qualified laboratory?	<u>X</u>	—	—
49. Name of laboratory performing analyses?	<u>Brown & Caldwell</u>		
50. Are analytical methods described in the records?	<u>Analytical Technologies, Inc.</u>		
	—	<u>X</u> *	—
51. Are the required ground water quality parameters being tested for? (Chloride, phenol, etc.)	<u>X</u>	—	—
52. Are the required ground water contamination indicator parameters being tested for? (pH, Conductance, total organic carbon, total organic halogen)	<u>X</u>	—	—
53. Are any analytical parameters determined in the field?	<u>X</u> - pH, sp. cond., temp.		
54. Are field activity logs included?	<u>X</u>	—	—
55. Are field activity logs filled in as samples are being collected?	<u>X</u>	—	—
56. Are the names and position of the field personnel included in the field logs?	—	<u>X</u>	—
57. Is an analysis program set up to determine the presence of contamination using EPA guidelines?	<u>N/A</u> *	—	—
58. Have all record keeping requirements been met?	—	<u>X</u> *	—

- | | <u>Yes</u> | <u>No</u> | <u>Unknown</u> |
|---|------------------------------|-----------|----------------|
| 59. List all records kept at the facility. | * | | |
| <hr/> | | | |
| <hr/> | | | |
| 60. Are there relevant records at the facility which should be provided to the Department? | <u>X</u> | | |
| If yes, list them. | <u>information regarding</u> | | |
| <u>the extraction well Ex-1 including location, justification for location,</u> | | | |
| <u>and details of the well design.</u> | | | |
| <hr/> | | | |
| 61. Brief summary of site conditions and comments on the ground water monitoring program at this site. | * | | |
| <hr/> | | | |
| <hr/> | | | |
| <hr/> | | | |
| 62. Is a more detailed technical evaluation required to determine the adequacy of the ground water monitoring program at this site? | | <u>X</u> | |
| Why? | <hr/> | | |
| <u>Adequacy of the ground water monitoring program has been determined.</u> | | | |

Comments for Appendix B

Pond 1 was a 36,000-gallon treatment pond constructed of 6-inch steel reinforced concrete. In 1985, pond use was discontinued. Subsequently, the pond was coated with asphalt and converted into a secondary spill containment for above-ground tanks.

2. The facility's consultant, J. H. Kleinfelder & Associates, has submitted a "Work Plan for Assessment Phase" [7]. Some procedures and materials described in the plan were not observed during the inspection. For example, the Work Plan specified that samples would be taken using a stainless steel and viton bladder pump. The Task Force observed a silicon bladder pump being used for sampling. Also there is no formal Sampling and Analysis Plan; the facility is following "ground water monitoring protocols and procedures" as described in Appendix A of the Work Plan.
3. A geologic map was not included in the Assessment Report [9]. Lithology descriptions appeared to be accurate however, the geologic consultant has misidentified the aquifer sequence (ie. Hollydale Aquifer as the Jefferson Aquifer). The regional cross section included in the Assessment Report was taken incorrectly from Bulletin 104 [2] and does not apply to this site. Further, the consultant has mislocated the site on this cross section. Primary and secondary permeability is not addressed in the Assessment Report.
 - The Assessment Report did not include a topographic map.
 - The O/O had made several changes to the site since the descriptions in the Assessment Report. For example, a copper-sulfate operation had been removed, tanks had been relocated, and a past waste disposal area had been paved.
6. The Assessment Report [9] did not include a topographic map.
9. Adjacent water bodies were not tested.
11. According to the Assessment Report [9] there are 4 pumping wells within a 1 mile radius. Their location and their effect on ground water flow were not addressed and the wells were not observed during the site inspection.
16. There are 4 upgradient wells - MW-1, MW-2, MW-9, MW-11. Only MW-1 is an adequate upgradient well. MW-2 is contaminated with organics and MW-9 is contaminated with chromium from a source other than Pond 1. MW-11 is not upgradient of the pond area. In addition, there are 5 wells neither upgradient nor downgradient that are in the vicinity of Pond 1 - MW-3, MW-6A, MW-6B, MW-8, MW-10.

18. There are 4 downgradient wells - MW4, MW4A, MW-5, MW-7. MW-7 is not an adequate downgradient well because it is not down gradient of Pond 1. MW-4, MW-4A, and MW-5 are spaced too far apart to adequately characterize any contamination from Pond 1.
20. Downgradient well placement is not adequate to characterize contamination from Pond 1 because the three relevant downgradient wells are spaced too far apart and because well placement is based on inadequate site characterization. Following an adequate site characterization, additional wells spaced between those existing and screened at proper intervals will be necessary to characterize the contamination from Pond 1.
23. During the inspection, the Task Force observed water standing in the vault around three wells. The water level in MW-10 vault was 2 to 3 inches with blue-green and white crystals indicating a potential source of contamination to the well.
24. According to the facility consultant, the caps could only be opened with a special hollow Allen-wrench, but the caps did not have locks. During the field inspection one cap was off, two caps were broken, and two more caps were not screwed back on after sampling.
27. The O/O had made several changes to the site since the descriptions in the Assessment Report. For example, a copper-sulfate operation had been removed, tanks had been relocated, and a past waste disposal area had been paved.
- 31.
- | | <u>measured well depth</u> | <u>reported well depth</u> |
|-----|----------------------------|----------------------------|
| MW2 | 70.80' | 75.0' |
| MW3 | 70.88' | 75.0' |
| MW4 | 67.35' | 75.0' |
| MW8 | 69.99' | 75.0' |
32. MW-6A was not sounded because no samples have been taken from the well and the consultant claims the well is dry.
33. According to J. H. Kleinfelder & Associates, MW-6A is dry; however, they also reported two water level readings - 4/85 and 8/85.
34. According to J. H. Kleinfelder & Associates, MW-6A is dry; however, they also reported two water level readings - 4/85 and 8/85.
36. Task Force members observed 3 wells being sampled - MW-3, MW-4, MW-11.
38. The facility's consultant, J. H. Kleinfelder & Associates, has submitted a "Work Plan for Assessment Phase" [7]. Some

procedures and materials described in the plan were not observed during the inspection. For example, the Work Plan specified that samples would be taken using a stainless steel and viton bladder pump. The Task Force observed a silicon bladder pump being used for sampling. Also there is no formal Sampling and Analysis Plan; the facility is following "ground water monitoring protocols and procedures" as described in Appendix A of the Work Plan.

- 39. - The Work Plan [7] does not address sampling methods.
 - The Work Plan [7] does not address sample preservation.
 - The Work Plan [7] does not address specific sample analysis.
 - The Work Plan [7] does not address record keeping.
40. The Work Plan specifies only that sampling methods will be in accordance with 14th Edition of Standard Methods. The Task Force observed that certain sample collection methods, preservation methods, and sample preparations were not appropriate. For example, there was headspace in the sample bottles for TOX and TOC and the consultant did not follow a certain order when collecting samples. Sample bottles were marked with a test lab label, Brown & Caldwell Laboratories, Pasadena, CA, then they were sent to Analytical Technologies, Inc., San Diego, CA. Sample holding times, sampling procedures, and chain-of-custody control procedures are not clearly defined in the Work Plan [7].
42. The Work Plan specifies only that sampling methods will be in accordance with 14th Edition of Standard Methods. The Task Force observed that certain sample collection methods, preservation methods, and sample preparations were not appropriate. For example, there was headspace in the sample bottles for TOX and TOC and the consultant did not follow a certain order when collecting samples. Sample bottles were marked with a test lab label, Brown & Caldwell Laboratories, Pasadena, CA, then they were sent to Analytical Technologies, Inc., San Diego, CA. Sample holding times, sampling procedures, and chain-of-custody control procedures are not clearly defined in the Work Plan [7].
43. The samples were pre-preserved by the laboratory and were not observed by the Task Force.
47. The Work Plan [7] states only that a chain-of-custody procedure will be used; there are no details.
50. The Work Plan [7] does not address analytical methods, however, laboratory methods used were reported in the Quarterly Sampling Reports.

57. The presence of contamination has already been established.
58. The 4th Quarter Sampling Report 1987 was not submitted as of this date.
59. Records kept at the facility are too voluminous to list. All hydrogeological reports, Quarterly Sampling Reports, site operational papers, manifests, etc. are kept at the facility, but when asked for a copy of the Sampling and Analysis Plan the O/O could not provide one.
61. SCCC is located in an industrial area where ground water contamination is common. SCCC has been operating since 1958 and past procedures and disposals have not been documented. Old operations have been built over with new operations which may or may not process the same chemicals. During the first sampling of RCRA detection monitoring SCCC discovered chromium contamination in two wells and launched SCCC into Assessment. The O/O has stated that the leak came from an old underground tank but they can not provide any records that prove the tank existed. One of the wells contaminated with the highest levels of chromium is immediately downgradient of Pond 1 which received chromium wastes. Well placement based on inadequate site characterization is not adequate to determine the rate, nature, and extent of any leaks. Also the sampling and analysis plan is inadequate.

APPENDIX C

1985 PUMP TEST DATA

PROJECT NUMBER Q-1014-2 SOUNDER NUMBER 1
 TEST TYPE Step drawdown WELL NUMBER 9 pumping well
 REFERENCE POINT Top of 5/8" plate above top of fill ring

DATE	TIME		DEPTH TO WATER (FEET)	DRAW DOWN (RECOVERY) (FEET)	PUMPING RATE (METER) GPM		OBSERVATIONS
	ELAPSED (MIN.)	24 HOUR					
8-19-85	0	0	44.26	0.00	171274		
	1	1	50.79	6.53		24.2	
	2	2	49.78	4.42		24.2	
	3	3				24.2	
	4	4	51.62	7.36		24.2	
	5	5	52.10	7.84		24.2	
	6	6	52.09	7.83		24.2	
	7	7	52.28	8.16		24.2	
	8	8	52.41	8.15		24.2	
	9	9	52.28	8.02		24.2	
	10	10	52.38	8.12		24.2	
	12	12	52.45	8.19	171565	24.2	
	14	14	52.40	8.14		22.6	
	16	16	52.60	8.34		22.6	
	18	18	52.54	8.28		22.6	
	20	20	52.62	8.36	171746	22.6	
	25	25	52.71	8.45		24.2	
	30	30	52.95	8.69	171988		
	35	35	52.93	8.67	172120	26.4	
	40	40	52.96	8.70	172225	21.0	
	45	45	53.09	8.83	172348	24.6	
	50	50	53.12	8.86	172452	20.8	
	55	55	53.18	8.92	172562	22.0	
	60	60	53.21	8.95	172675	22.6	



SOUNDER NUMBER 1

WELL NUMBER #9 pump well

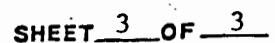
REFERENCE POINT.

[illegible]

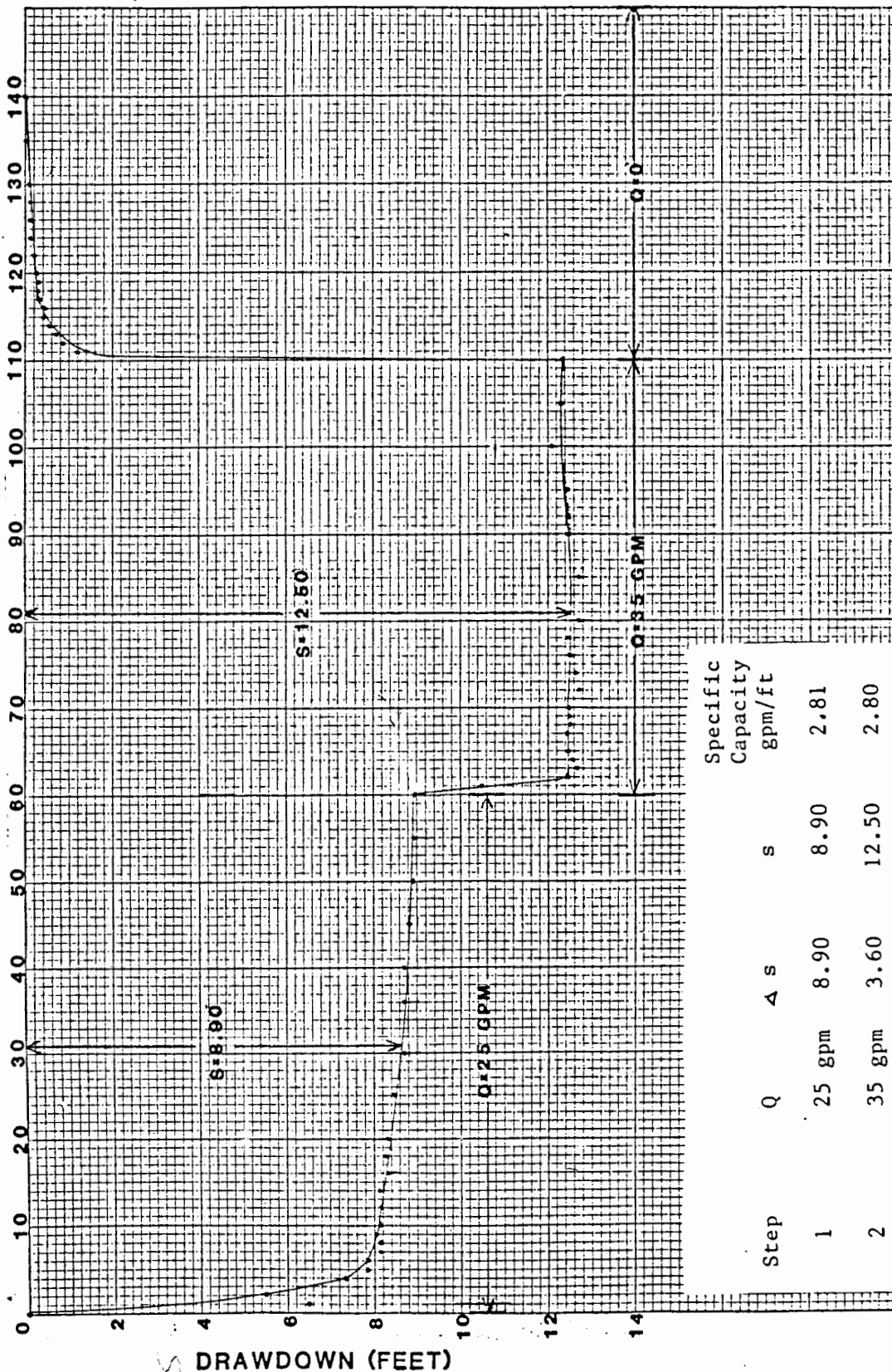
J. H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PUMPING TEST RECORD

SHEET 2 OF 3

[illegible]

TIME (MIN.)



J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL & GROUNDWATER CONSULTANTS



SOUTHERN CALIFORNIA CHEMICAL CO., INC.
SANTA FE SPRINGS, CALIFORNIA
STEP DRAWDOWN TEST

Project Number Q1014-1

March 1986

PLATE

PROJECT NUMBER Q-1014-2

SOUNDER NUMBER 2

TEST TYPE Step Drawdown

WELL NUMBER _____ MW8

REFERENCE POINT Top of PVC casing

[illegible]

J. H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PUMPING TEST RECORD

SHEET 1 OF 3

SOUNDER NUMBER 2

WELL NUMBER _____ MW-8

REFERENCE POINT.

[illegible]

J. H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PUMPING TEST RECORD

SHEET 2 OF 3

SOUNDER NUMBER 2

WELL NUMBER MW 8

REFERENCE POINT

[illegible]

J. H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PUMPING TEST RECORD

SHEET 3 OF 3

Not computed

7

[illegible][illegible]

1

PROJECT NUMBER Q-1014-2SOUNDER NUMBER #2TEST TYPE Pump TestWELL NUMBER #9 Pumping wellREFERENCE POINT top of 5/8" thick plate on top of rim

DATE	TIME		DEPTH TO WATER (FEET)	DRAW DOWN (RECOVERY) (FEET)	PUMPING RATE	GPM	OBSERVATIONS
	ELAPSED (MIN.)	24 HOUR					
8-29-95							
		9:00am	44.90				
	0		44.89	0			
	1		49.21	4.32			
	2		51.18	6.29			
	3		53.65	8.76			
	4		53.65	8.76			
	5		55.60	10.71			
	6		54.36	9.47			
	7		54.34	9.45			
	8		56.03	11.14			
	9		56.53	11.64			
	10		56.75	11.86		32.8	
	12		56.65	11.76			
	14		56.62	11.73		34.2	
	16		56.47	11.58			
	18		56.46	11.57			
	20		56.43	11.54		35.6	
	25		56.54	11.65		36.6	
	30		56.65	11.76		32.2	
	35		56.65	11.76		35.0	
	40		56.65	11.76		32.4	
	45		56.68	11.79		30.0	
	50		56.64	11.75		31.2	
	55		56.67	11.78		32.4	
	60		56.78	11.89		29.0	
	70		56.53	11.64		30.5	
	80		56.54	11.65		28.9	
	90		56.46	11.57		27.5	

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PUMPING TEST RECORD

SHEET ____ OF ____

SOUNDER NUMBER

TEST TYPE.

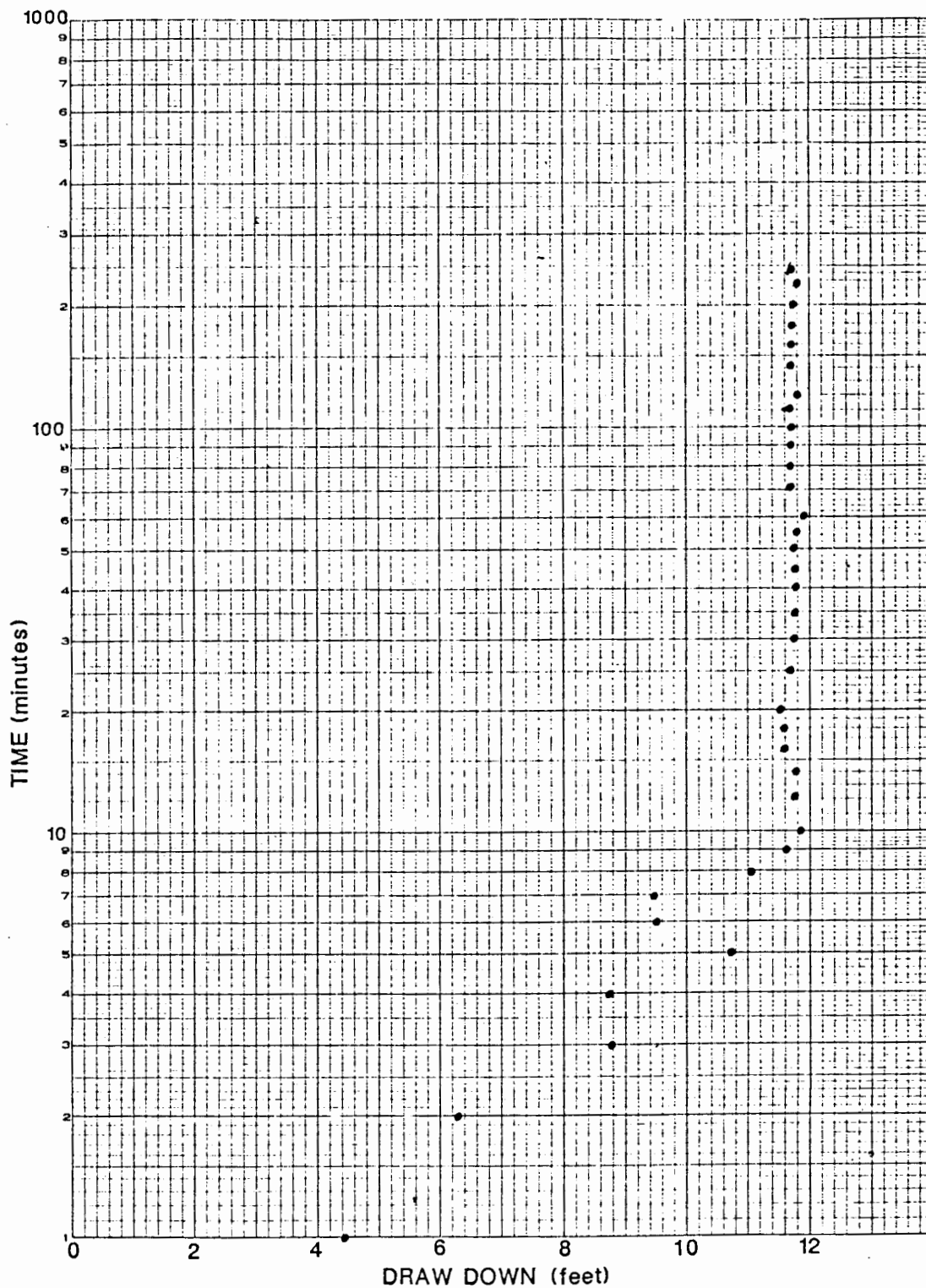
WELL NUMBER #9 pumping well

REFERENCE POINT.

PUMPING TEST RECORD



SHEET _____ OF _____



J.H. KLEINFELDER & ASSOCIATES
 GEOTECHNICAL & GROUNDWATER CONSULTANTS



Project Number Q1014-1

March 1986

SOUTHERN CALIFORNIA CHEMICAL CO., INC.
 SANTA FE SPRINGS, CALIFORNIA
 PUMPING WELL
 DRAWDOWN MW 9

PLATE

PROJECT NUMBER Q-1014-2 SOUNDER NUMBER 1
 TEST TYPE Pump Test WELL NUMBER MW 8
 REFERENCE POINT _____

DATE	TIME		DEPTH TO WATER (FEET)	DRAW DOWN (RECOVERY) (FEET)	PUMPING RATE (GPM)		OBSERVATIONS
	ELAPSED (MIN.)	24 HOUR					
8-29-85		9:30	43.33				
	0	9:40	43.33	0			
	1		43.33	0			
	2		43.36	0.03			
	3		43.40	0.07			
	4		43.41	0.08			
	5		43.39	0.06			
	6		43.46	0.13			
	7		43.46	0.13			
	8		43.48	0.15			
	9		43.49	0.16			
	10		43.49	0.16			
	12		43.53	0.20			
	14		43.54	0.21			
	16		43.55	0.22			
	18		43.56	0.23			
	20		43.56	0.23			
	25		43.55	0.22			
	30		43.62	0.22			
	35		43.64	0.31			
	40		43.64	0.31			
	45		43.64	0.31			
	50		43.64	0.31			
	55		43.64	0.31			
	60		43.66	0.33			
	70		43.67	0.34			
	80		43.67	0.34			
	90		46.66	0.33			



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 GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PUMPING TEST RECORD

SHEET 1 OF 3

SOUNDER NUMBER 1

WELL NUMBER #8

REFERENCE POINT.

PUMPING TEST RECORD



PROJECT NUMBER Q-1014-2 SOUNDER NUMBER #1
 TEST TYPE Pump Test-recovery WELL NUMBER #8
 REFERENCE POINT _____

DATE	TIME		DEPTH TO WATER (FEET)	DRAW DOWN (RECOVERY) (FEET)	PUMPING RATE (GPM)		OBSERVATIONS
	ELAPSED (MIN.)	24 HOUR					
	0		43.63	0.00			
	1	1350	43.61	0.02			
	2		43.62	0.01			
	3		43.60	0.03			
	4		43.59	0.04			
	5		43.56	0.07			
	6		43.52	0.09			
	7		43.52	0.11			
	8		43.51	0.12			
	9		43.51	0.12			
	10		43.50	0.13			
	12		43.49	0.14			
	14		43.48	0.15			
	16		43.48	0.15			
	18		43.46	0.17			
	20		43.46	0.17			
	25		43.44	0.19			
	30		43.43	0.20			
	35		43.43	0.20			
	40		43.40	0.23			
	45		43.40	0.23			
	50		43.39	0.24			
	55		43.39	0.24			
	60		43.38	0.25			
	70		43.37	0.26			
	80		43.36	0.27			
	90		43.35	0.28			
	100		43.35	0.28			
	110		43.34	0.29			



120 43.34 0.29
 J. H. KLEINFELDER & ASSOCIATES
 GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PUMPING TEST RECORD

PROJECT NUMBER Q-1014-2 SOUNDER NUMBER 1
 TEST TYPE Pump Test WELL NUMBER MW 8
 REFERENCE POINT _____

DATE	TIME		DEPTH TO WATER (FEET)	DRAW DOWN (RECOVERY) (FEET)	PUMPING RATE (GPM)		OBSERVATIONS
	ELAPSED (MIN.)	24 HOUR					
8-29-85		9:30	43.33				
	0	9:40	43.33	0			
	1		43.33	0			
	2		43.36	0.03			
	3		43.40	0.07			
	4		43.41	0.08			
	5		43.39	0.06			
	6		43.46	0.13			
	7		43.46	0.13			
	8		43.48	0.15			
	9		43.49	0.16			
	10		43.49	0.16			
	12		43.53	0.20			
	14		43.54	0.21			
	16		43.55	0.22			
	18		43.56	0.23			
	20		43.56	0.23			
	25		43.55	0.22			
	30		43.62	0.22			
	35		43.64	0.31			
	40		43.64	0.31			
	45		43.64	0.31			
	50		43.64	0.31			
	55		43.64	0.31			
	60		43.66	0.33			
	70		43.67	0.34			
	80		43.67	0.34			
	90		46.66	0.33			

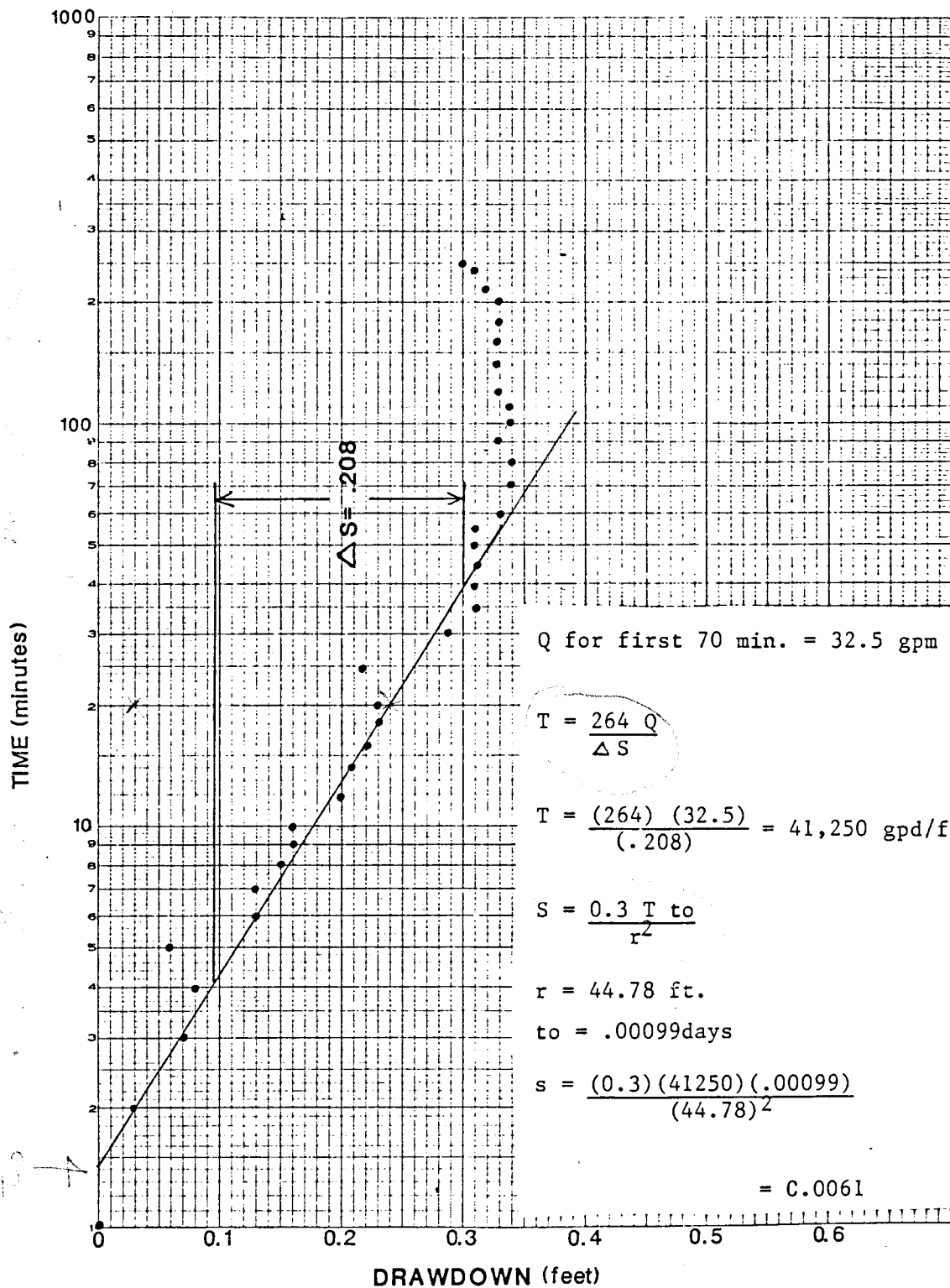


J. H. KLEINFELDER & ASSOCIATES
 GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PUMPING TEST RECORD

SHEET 1 OF 3

[illegible][illegible]



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GEOTECHNICAL & GROUNDWATER CONSULTANTS

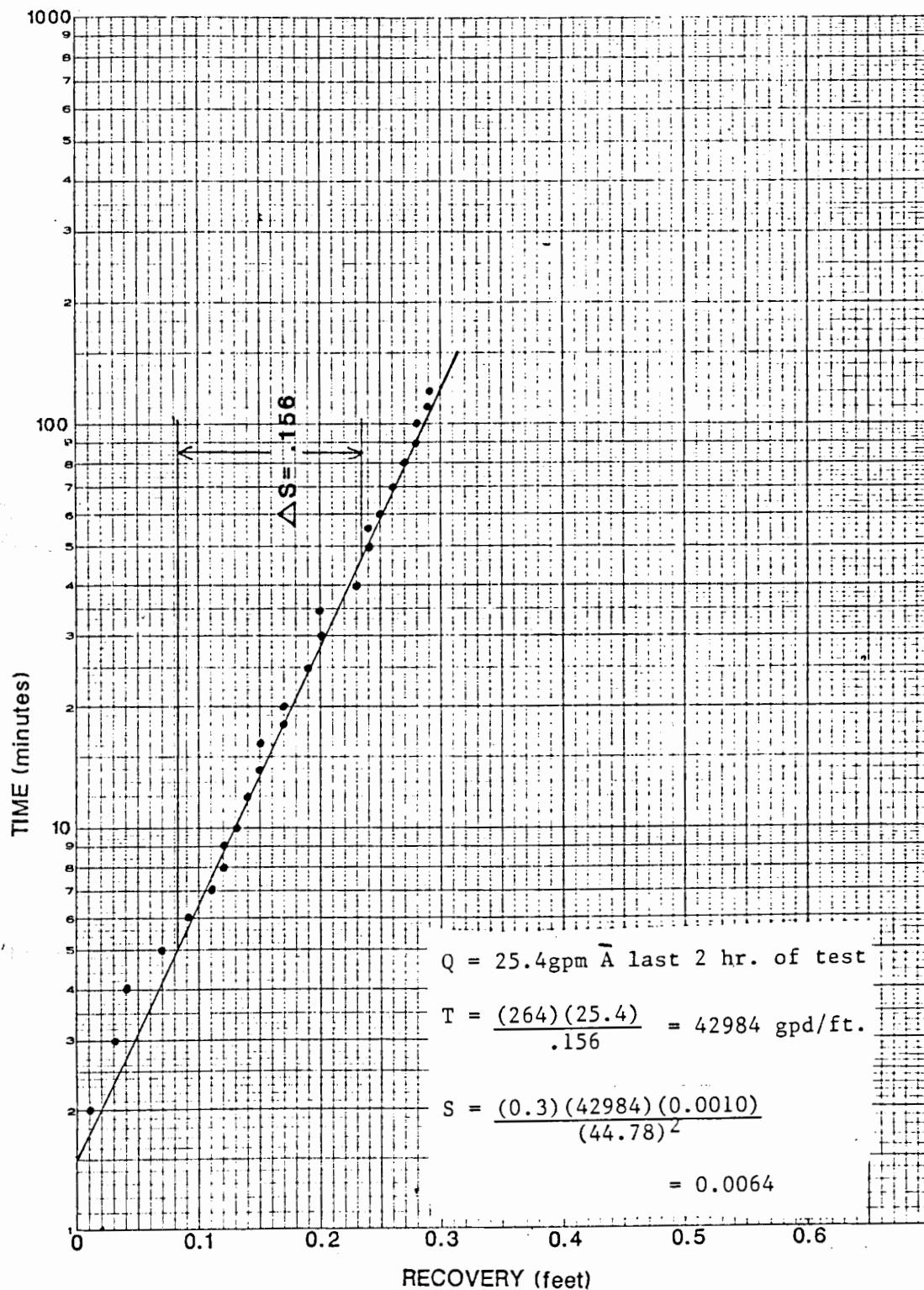


Project Number Q1014-2

March 1986

SOUTHERN CALIFORNIA CHEMICAL CO., INC.
SANTA FE SPRINGS, CALIFORNIA
JACOB-COOPER APPROXIMATION
DRAWDOWN MW 8

PLATE

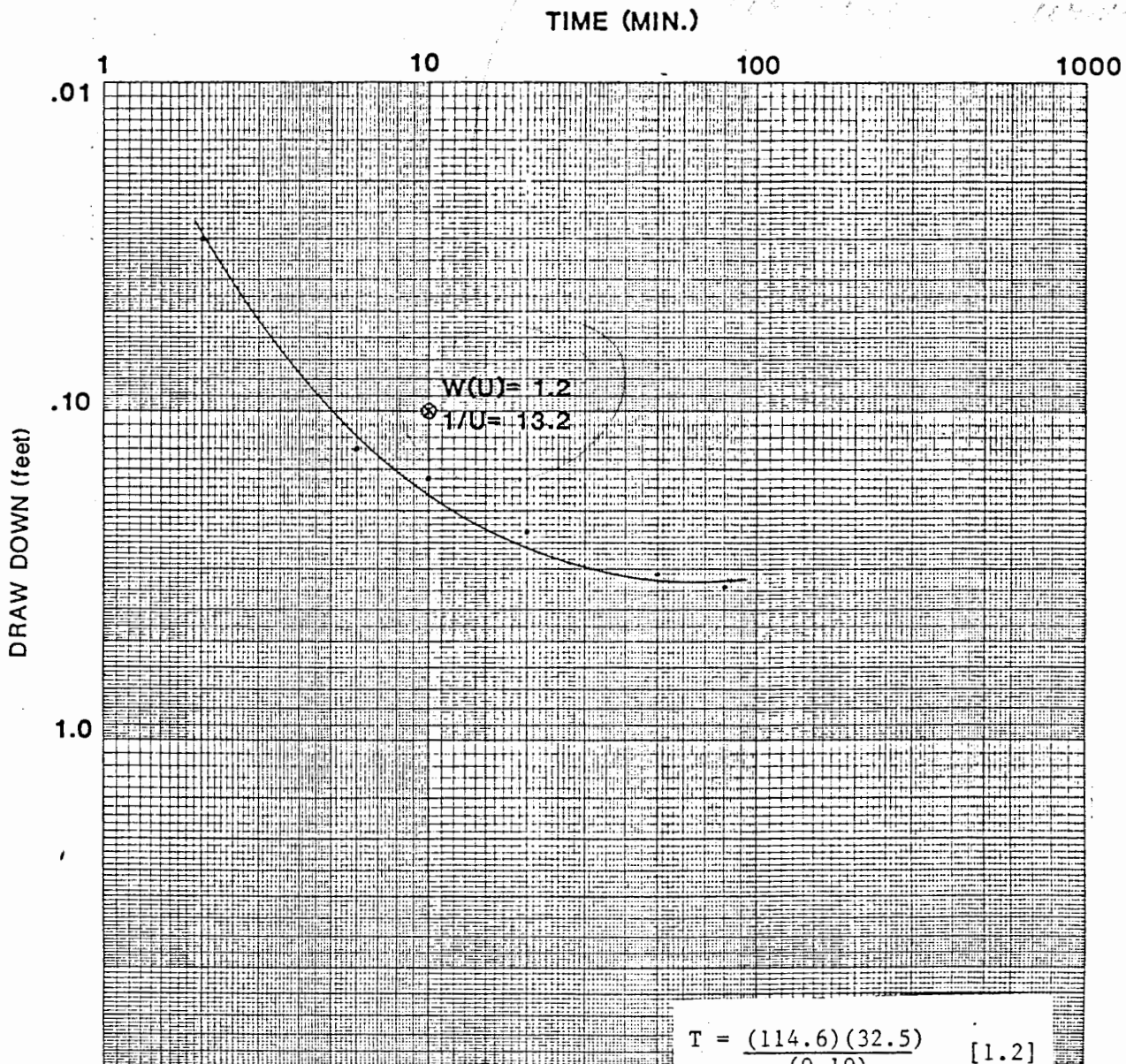


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SOUTHERN CALIFORNIA CHEMICAL CO., INC.
 SANTA FE SPRINGS, CALIFORNIA
 JACOB-COOPER APPROXIMATION
 RECOVERY MW 8

PLATE



$$T = \frac{(114.6)(32.5)}{(0.10)} \quad [1.2]$$

$$= 44694 \text{ gpd/ft.}$$

$$S = \frac{(0.076)(44694)(.0069)}{(1.87)(44.78)^2}$$

$$= .0062$$

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SOUTHERN CALIFORNIA CHEMICAL CO., INC
SANTA FE SPRINGS, CALIFORNIA
THEIS CURVE MATCHING
DRAWDOWN MW 8

PLATE

Project Number Q1014-2 MARCH 1986

PROJECT NUMBER Q-1014-2SOUNDER NUMBER 3TEST TYPE Pump TestWELL NUMBER MW #10

REFERENCE POINT _____

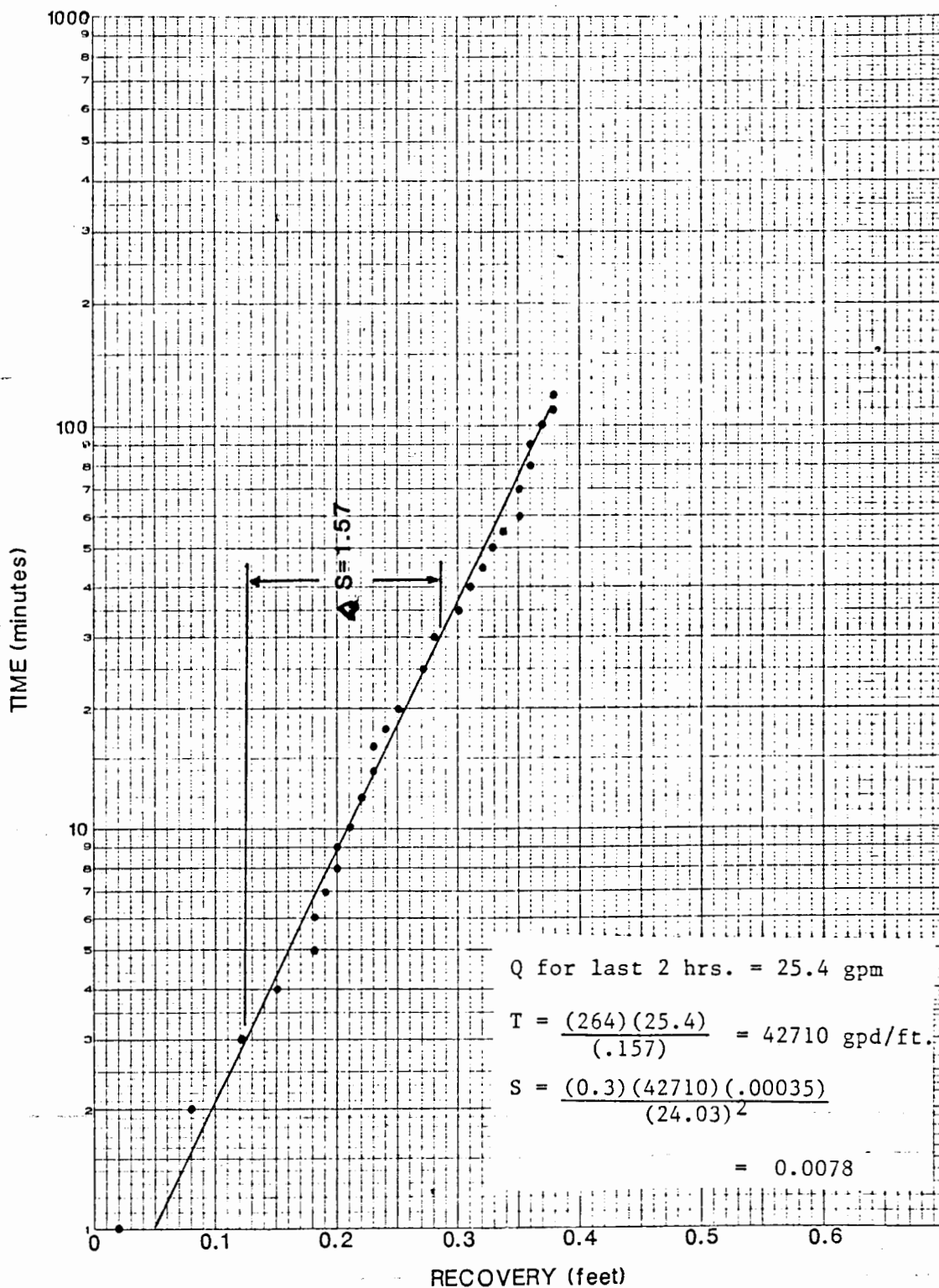
DATE	TIME		DEPTH TO WATER (FEET)	DRAW DOWN (RECOVERY) (FEET)	PUMPING RATE (GPM)		OBSERVATIONS
	ELAPSED (MIN.)	24 HOUR					
9/29/85							
	Start Recovery @ 1:51 p.m.						
	0		45.75	0.00			
	1		45.73	0.02			
	2		45.67	0.08			
	3		45.63	0.12			
	4		45.60	0.15			
	5		45.57	0.18			
	6		45.57	0.18			
	7		45.56	0.19			
	8		45.55	0.20			
	9		45.55	0.20			
	10		45.54	0.21			
	12		45.53	0.22			
	14		45.52	0.23			
	16		45.52	0.23			
	18		45.51	0.24			
	20		45.50	0.25			
	25		45.48	0.27			
	30		45.47	0.28			
	35		45.45	0.30			
	40		45.44	0.31			
	45		45.43	0.32			
	50		45.42	0.33			
	55		45.41	0.34			
	60		45.40	0.35			
	70		45.40	0.35			
	80		45.39	0.36			
	90		45.39	0.36			

J. H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PUMPING TEST RECORD

SHEET ____ OF ____

[illegible][illegible]



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Project Number Q1014-2

March 1986

SOUTHERN CALIFORNIA CHEMICAL CO., INC.
SANTA FE SPRINGS, CALIFORNIA
JACOB-COOPER APPROXIMATED
RECOVERY MW 10

PLATE

PROJECT NUMBER Q-1014-2 SOUNDER NUMBER _____
 TEST TYPE Pump test WELL NUMBER MW 10
 REFERENCE POINT _____

DATE	TIME		DEPTH TO WATER (FEET)	DRAW DOWN (RECOVERY) (FEET)	PUMPING RATE (GPM)		OBSERVATIONS
	ELAPSED (MIN.)	24 HOUR					
		9:01	45.33				
8-29-85	0		45.35	0			
	1		45.39	0.04			
	2		45.45	0.10			
	3		45.50	0.15			
	4		45.53	0.18			
	5		45.57	0.22			
	6		45.59	0.24			
	7		45.60	0.25			
	8		45.62	0.27			
	9		45.64	0.29			
	10		45.65	0.30			
	12		45.66	0.31			
	14		45.67	0.32			
	16		45.69	0.34			
	18		45.71	0.36			
	20		45.74	0.39			
	25		45.77	0.42			
	30		45.78	0.43			
	35		45.79	0.44			
	40		45.80	0.45			
	45		45.81	0.45			
	50		45.81	0.46			
	55		45.81	0.46			
	60		45.81	0.46			
	70		45.81	0.46			
	80		45.82	0.47			
	90		45.82	0.47			

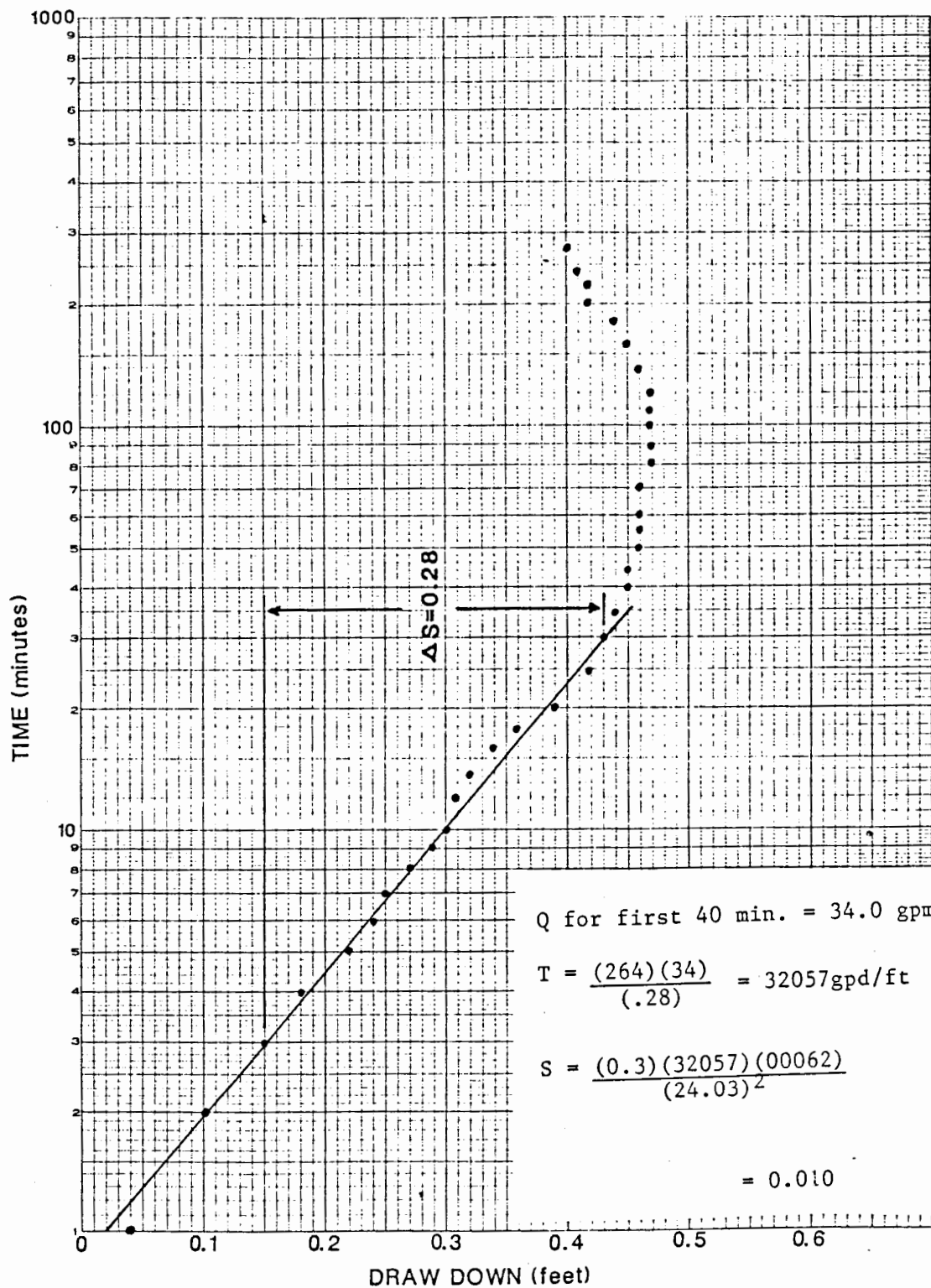


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 GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PUMPING TEST RECORD

SHEET _____ OF _____

[illegible][illegible]



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GEOTECHNICAL & GROUNDWATER CONSULTANTS

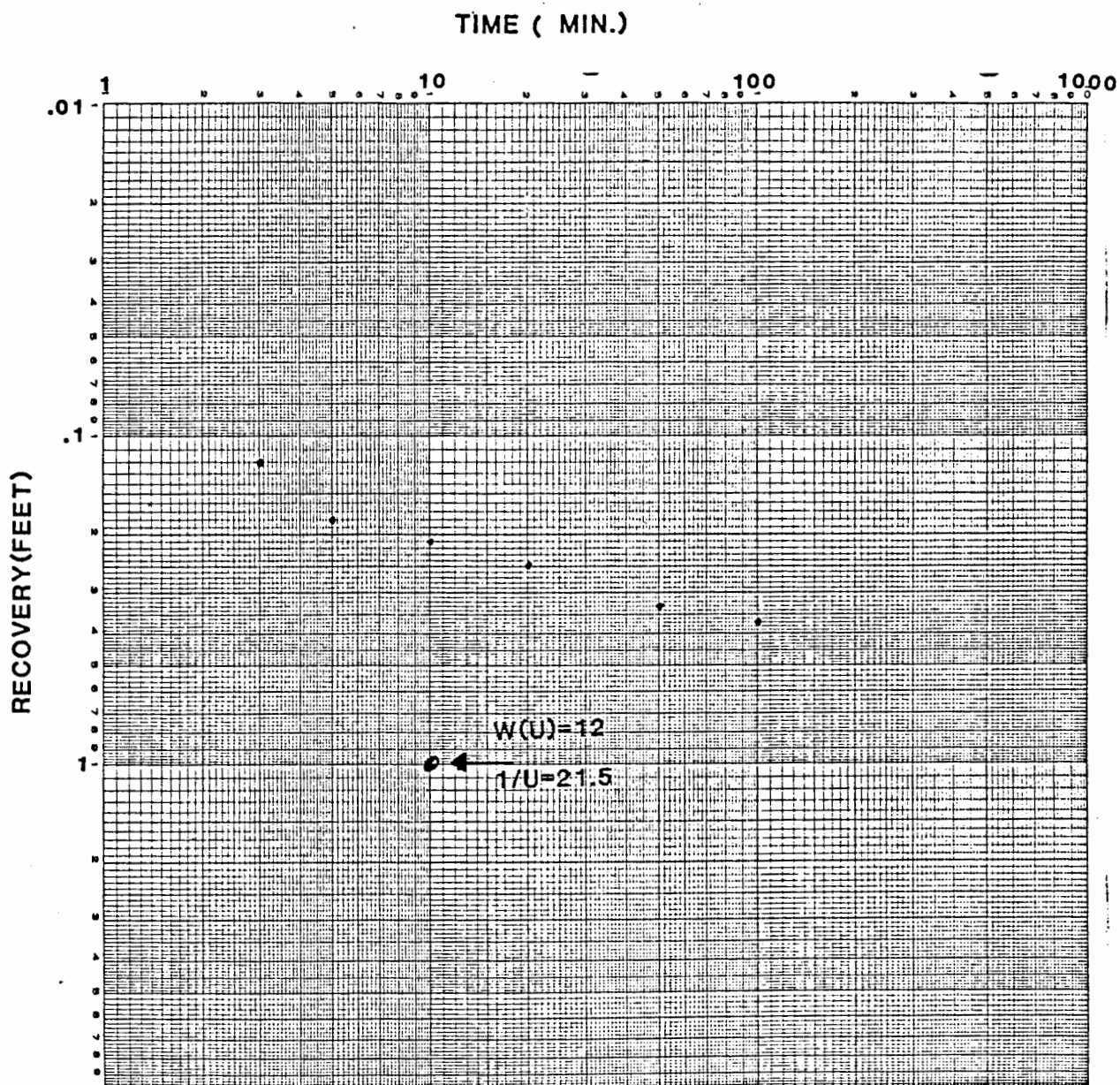


Project Number Q1014-2

March 1986

SOUTHERN CALIFORNIA CHEMICAL CO., INC.
SANTA FE SPRINGS, CALIFORNIA
JACOB COOPER APPROXIMATION
DRAWDOWN MW 10

PLATE



$$T = \frac{(114.6)(25.4)}{1} \quad (12)$$

$$= 34930 \text{ gpd/ft.}$$

$$S = \frac{(.046)(34930)(0.0069)}{(1.87)(24.03)^2}$$

$$= 0.010$$

J.H. KLEINFELDER & ASSOCIATES
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SOUTHERN CALIFORNIA CHEMICAL CO., INC.
 SANTA FE SPRINGS, CALIFORNIA
 THEIS CURVE MATCHING
 RECOVERY MW 10

PLATE

Project Number

PROJECT NUMBER Q-1014-2 SOUNDER NUMBER _____
 TEST TYPE Pumping Test WELL NUMBER MW 4
 REFERENCE POINT T.O.C. (south side)

DATE	TIME		DEPTH TO WATER (FEET)	DRAW DOWN (RECOVERY) (FEET)	PUMPING RATE (GPM)		OBSERVATIONS
	ELAPSED (MIN.)	24 HOUR					
		9:00	43.78				
8-29-85	0	09:41	43.78				
	1		43.81	.03			
	2		43.82	.04			
	3		43.84	.06			
	4		43.85	.07			
	5		43.83	.05			
	6		43.83	.05			
	7		43.83	.05			
	8		43.92	.04			
	9		43.82	.04			
	10		43.82	.04			
	12		43.82	.04			
	14		43.83	.05			
	16		43.83	.05			
	18		43.83	.05			
	20		43.83	.05			
	25		43.84	.06			
	30		43.84	.06			
	35		43.86	.08			
	40		43.88	.10			
	45		43.89	.11			
	50		43.90	.12			
	55		43.90	.12			
	60		43.91	.13			
	70		43.92	.14			
	80		43.94	.16			
	90		43.96	.18			



PROJECT NUMBER Q-1014-2 SOUNDER NUMBER 1
 TEST TYPE Pumping WELL NUMBER MW 4
 REFERENCE POINT T.O.C. Southside

DATE	TIME		DEPTH TO WATER (FEET)	DRAW DOWN (FEET)	RECOVERY (feet)		OBSERVATIONS
	ELAPSED (MIN.)	24 HOUR					
8-29-85	100		43.96	0.18			
	110		43.97	0.19			
	120		43.97	0.19			
	140		43.98	0.20			
	160		43.99	0.21			
	180		43.99	0.21			
	200		43.99	0.21			
	220		43.99	0.21			
	240		43.99	0.21			
	250		43.99	0.21	0.00		Shut down pump
	251		43.99	0.21	0.00		
	252		43.98	0.20	0.01		
	253		43.91				
	254		43.97	0.19	0.02		
	255		43.97	0.19	0.02		
	256		43.96	0.18	0.03		
	257		43.97	0.19	0.02		
	258		43.97	0.19	0.02		
	259		43.97	0.19	0.02		
	260		43.96	0.18	0.03		
	262		43.97	0.19	0.02		
	264		43.96	0.18	0.03		
	266		43.97	0.19	0.02		
	268		43.96	0.18	0.03		
	270		43.97	0.19	0.02		
	275		43.96	0.18	0.03		
	280		43.95	0.17	0.04		
	285		43.95	0.17	0.04		
	290		43.94	0.16	0.05		

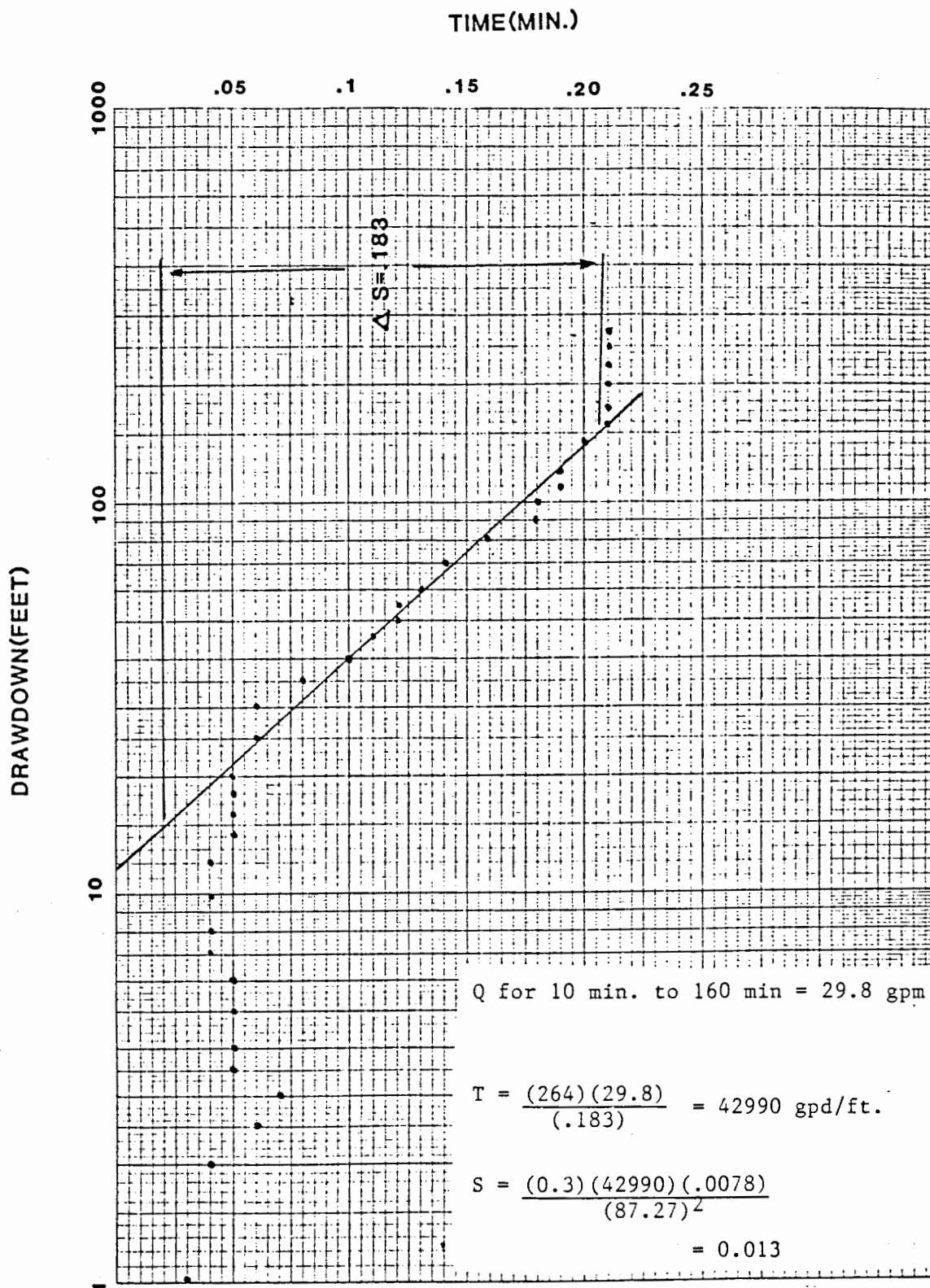


J. H. KLEINFELDER & ASSOCIATES
 GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PUMPING TEST RECORD

SHEET 2 OF 3

[illegible][illegible]



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 GEOTECHNICAL & GROUNDWATER CONSULTANTS



Project Number Q1014-2

MARCH 1986

SOUTHERN CALIFORNIA CHEMICAL CO., INC.
 SANTA FE SPRINGS, CALIFORNIA
 JACOB-COOPER APPROXIMATION

DRAWDOWN MW 4

PLATE

APPENDIX D

LITHOLOGIC LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	DESCRIPTION	MAJOR DIVISIONS		LTR	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel sand mixtures, little or no fines.	FINE GRAINED SOILS	SILTS AND CLAYS LL<50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		GP	Poorly-graded gravels or gravel sand mixture, little or no fines.			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		GM	Silty gravels, gravel-sand-clay mixtures.			OL	Organic silts and organic silt-clays of low plasticity
		GC	Clayey gravels, gravel-sand-clay mixtures.				
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.	SILTS AND CLAYS LL>50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		SP	Poorly-graded sands or gravelly sands, little or no fines.		CH	Inorganic clays of high plasticity, fat clays.	
		SM	Silty sands, sand-silt mixtures.		OH	Organic clays of medium to high plasticity.	
		SC	Clayey sands, sand-clay mixtures.		HIGHLY ORGANIC SOILS		Pt



Standard penetration split spoon sample



Modified California sampler



Shelby tube sample



Water level observed in boring

*

No recovery

NFWE

No free water encountered

NOTE:

The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

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BORING LOG LEGEND

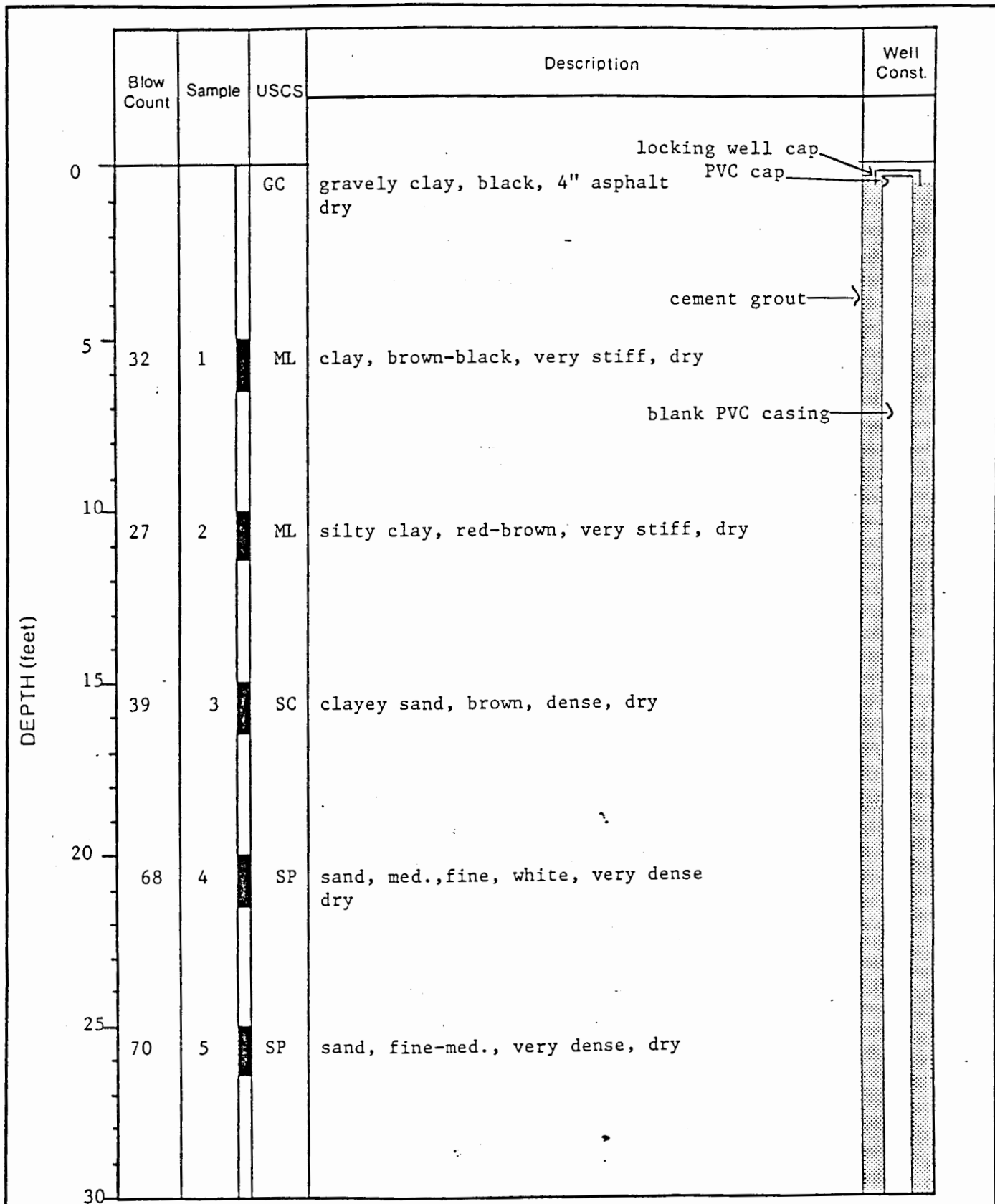
PREPARED BY: DATE:

CHECKED BY: DATE:

PROJECT NO.

PLATE

4



J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING



So. Calif. Chemical
Santa Fe Springs, Ca.

PLATE

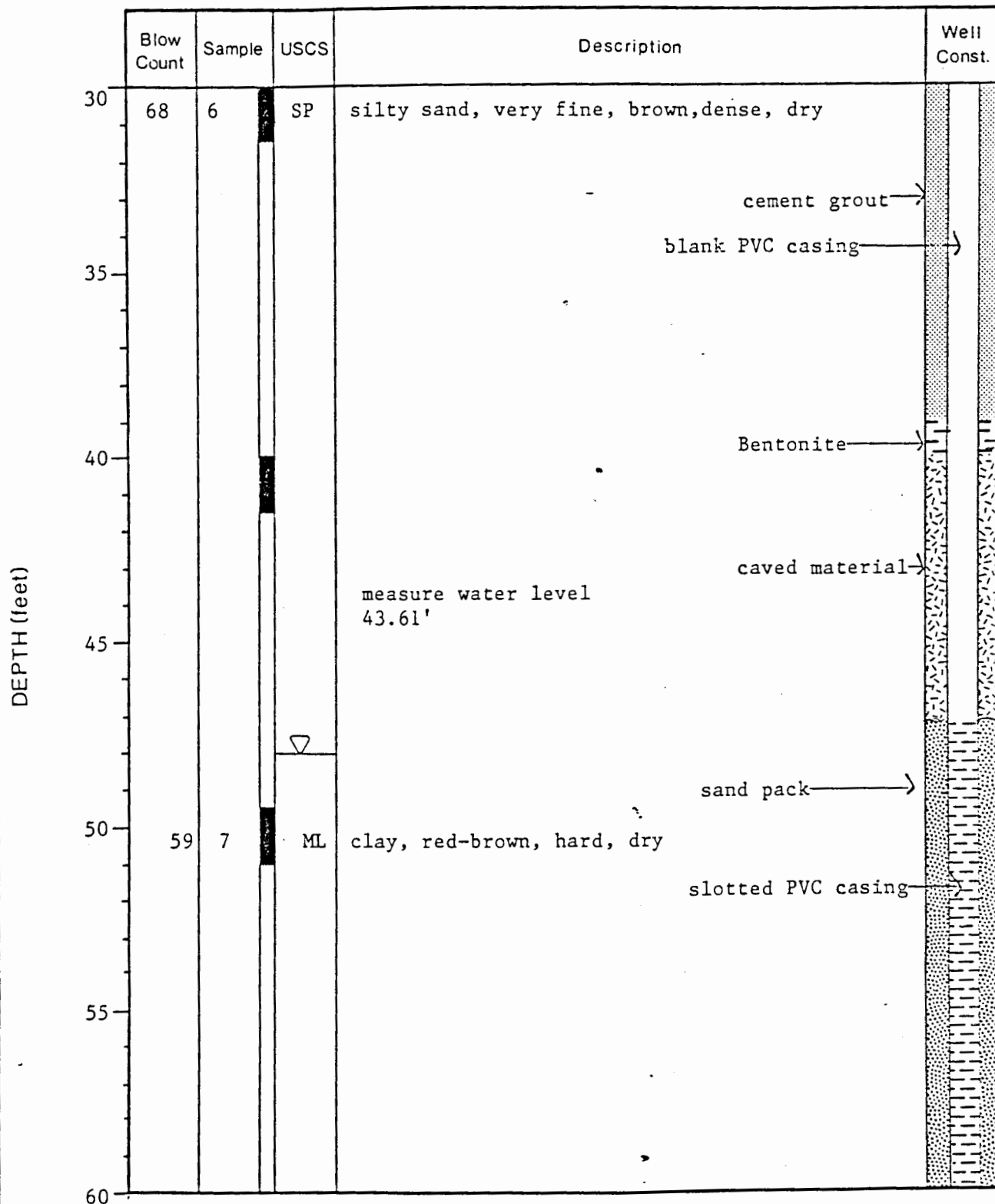
LOG of BORING MW-1

5

PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. Q-1014-1



J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING



So. Calif. Chemical
Santa Fe Springs, Ca.

LOG of BORING MW-1

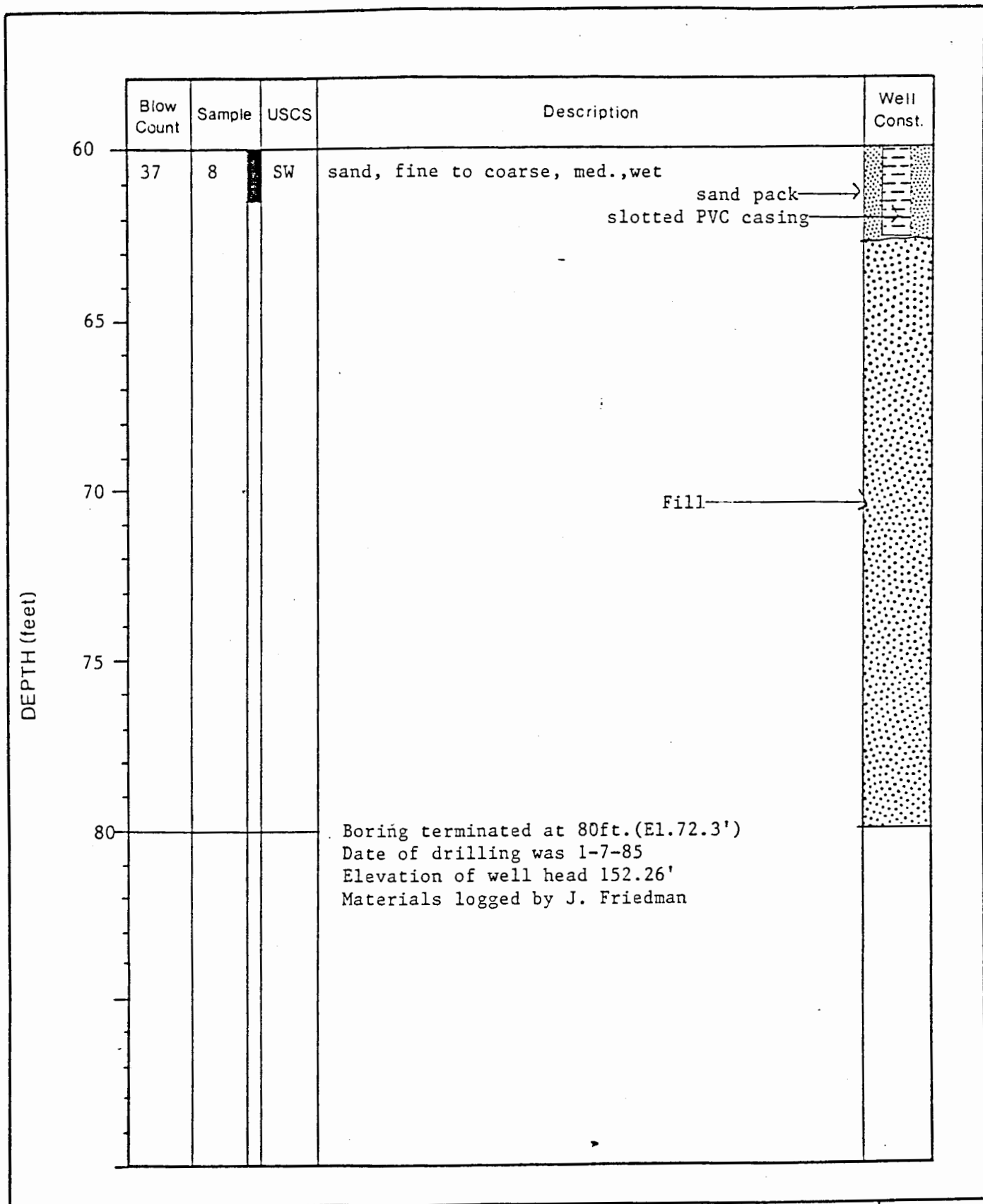
PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. Q-1014-1

PLATE

5



J.H. KLEINFELDER & ASSOCIATES
 GEOTECHNICAL CONSULTANTS • MATERIALS TESTING



So. Calif. Chemical
 Santa Fe Springs, Ca.

PLATE

5


LOG of BORING MW-1

PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. Q-1014-1

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
	0			PT	Organic silty clay, black 4" asphalt at surface
5	41			clay on outside of sampler	cement grout blank PVC casing
10					
15	32	1	ML	clayey silt, brown, very stiff, dry	
20					
25	63	2	ML SP	clayey silt end here sand, fine to med., dense, dry	
30					
35	72	3	SM	silty sand, brown v. dense, dry	
40					
45	70	4	SM	silty sand, brown, dense, dry	
50					

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GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

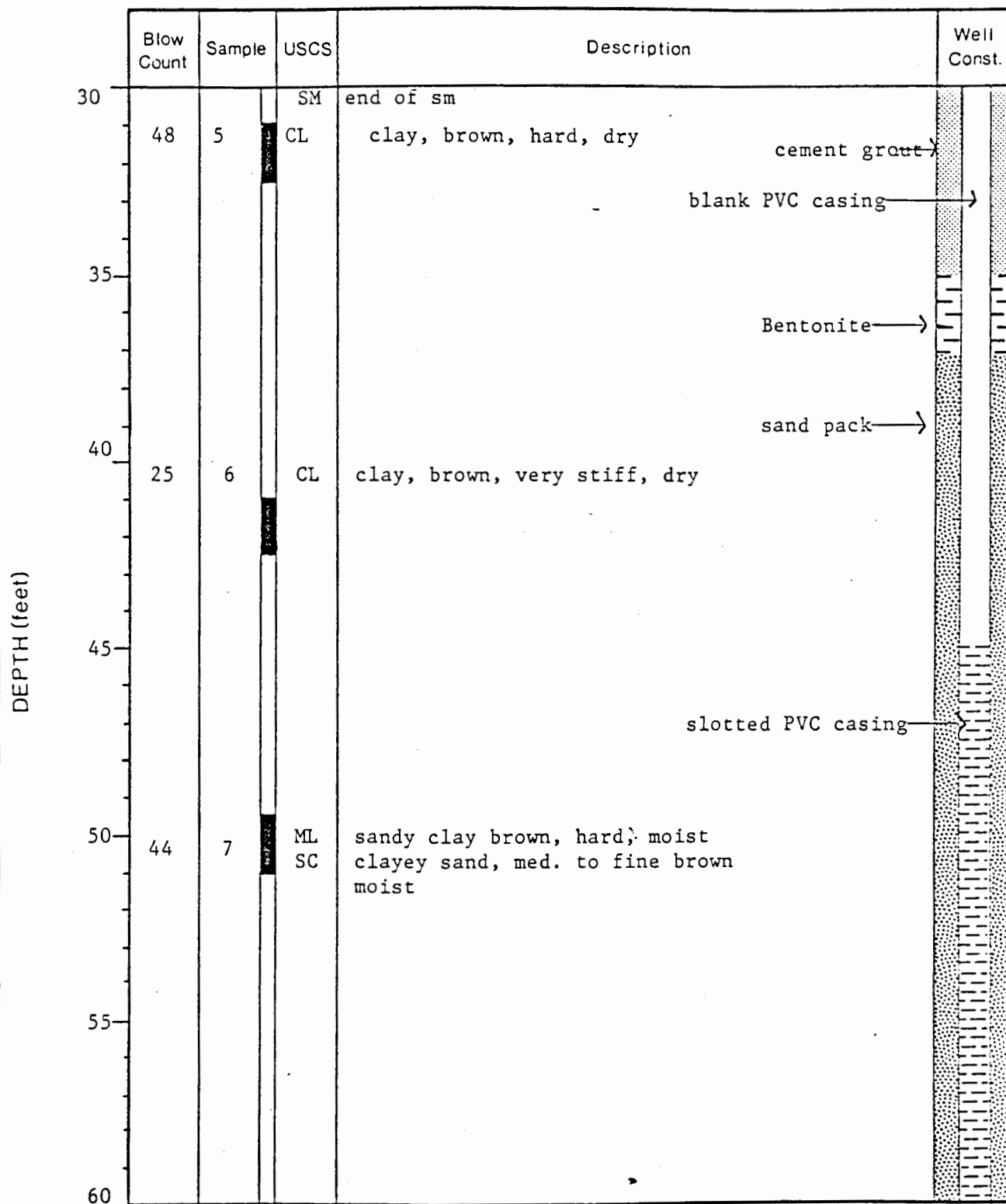
So. Calif. Chemical
Santa Fe Springs

LOG of BORING MW-2

PLATE

6

PREPARED BY: JF	DATE: 5/85
CHECKED BY:	DATE:
PROJECT NO. Q-1014-1	



J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING



So. Cal. Chemical
Santa Fe Springs, Ca.

LOG of BORING MW-2

PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. Q-1014-1

PLATE

6

DEPTH (feet)

Blow Count	Sample	USCS	Description	Well Const.
60	57	8	SP	sand fine, gray, dense, wet
				sand pack
65				slotted PVC casing
70				
75				
80				caved material
85				
90				

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So. Cal. Chemical
Santa Fe Springs, Ca.

PLATE

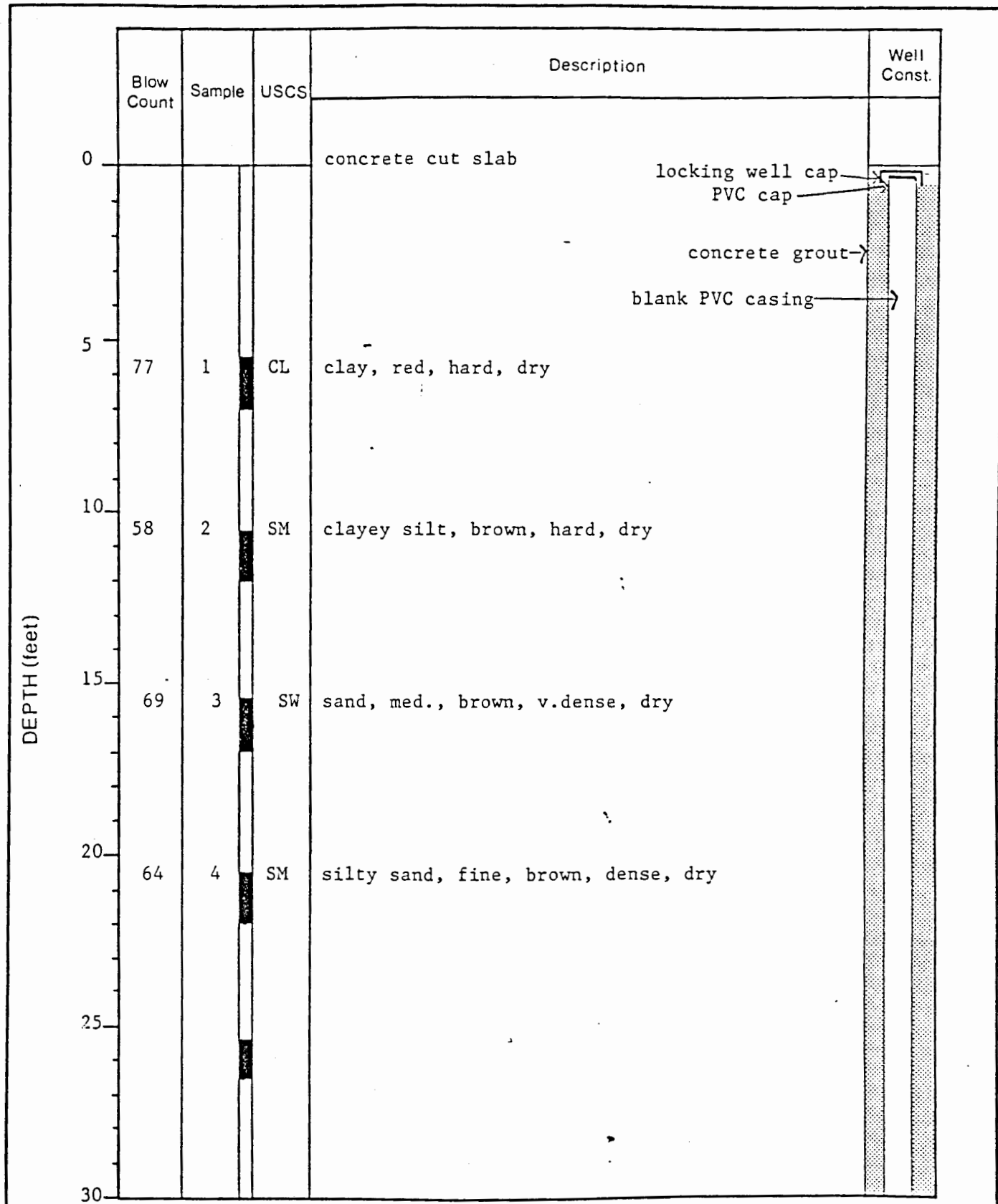
6

LOG of BORING MW-2

PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. Q-1041-1



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Santa Fe Springs

PLATE

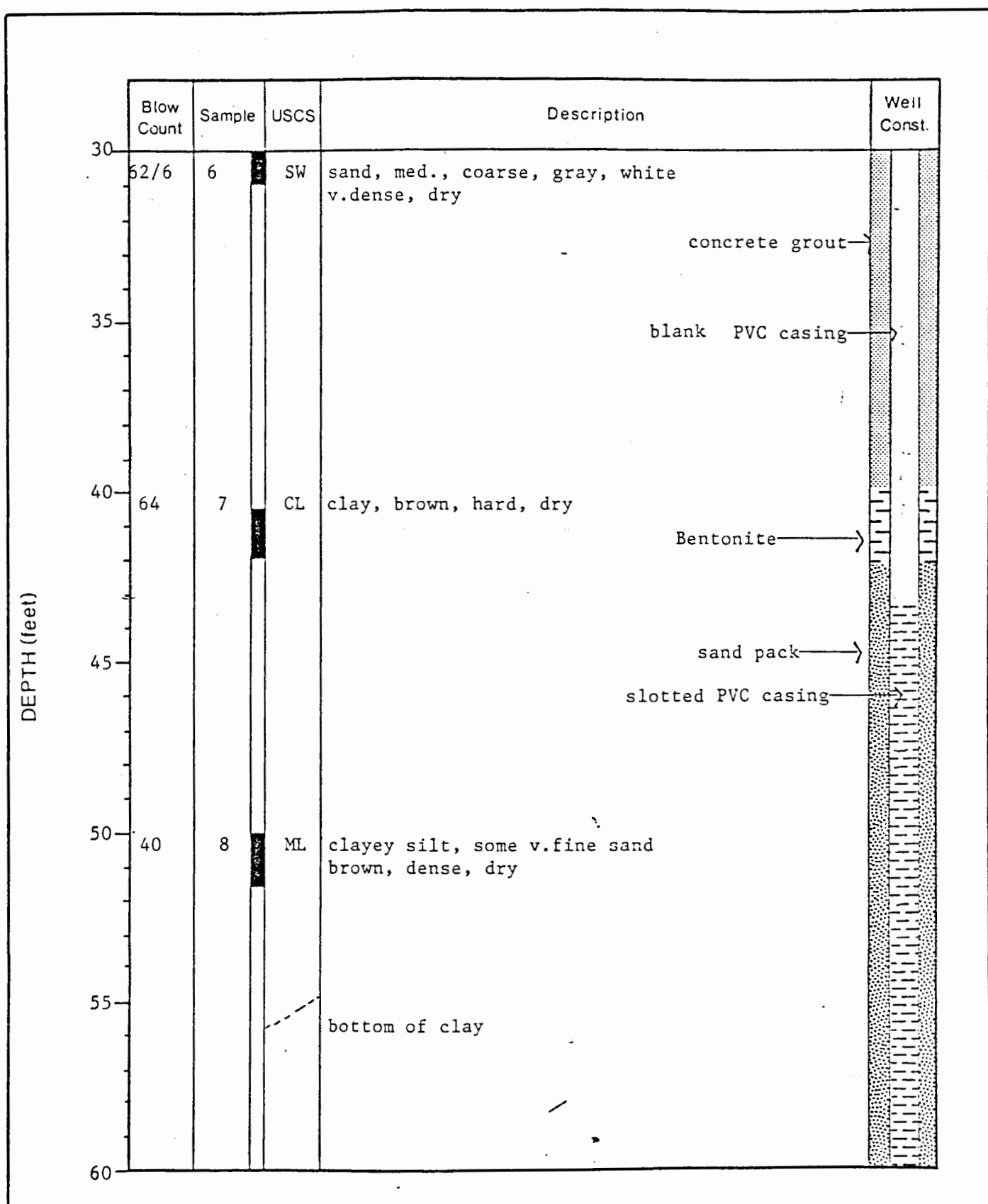
7

LOG of BORING MW-3

PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. Q-1014-1



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Santa Fe Springs

PLATE

7

LOG of BORING MW-3

PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. 0-1014-1

DEPTH (feet)

	Blow Count	Sample	USCS	Description	Well Const.
60	52/6	10	SM	<p>silty sand, v.fine, brown, very dense wet</p> <p>sand pack</p> <p>slotted PVC casing</p>	
65					
70					
75	50/6	10	SW	<p>sand, fine-med., brown V. dense, wet</p> <p>Boring terminated at 75 ft.(El.76.6') Date of drilling was 1-16-85 Elevation of well head 151.62' Materials logged by J. Friedman</p>	

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Santa Fe Springs

PLATE

LOG of BORING MW-3

7

PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. Q-1014-1

DEPTH (feet)

Blow Count	Sample	USCS	Description	Well Const.
0		SC	clayey sand, black lft.	locking well cap PVC cap
38	1	CL	clay, red, v.stiff, dry	cement grout
27	2	ML	silty clay, red, v.stiff, dry	blank PVC casing
40	3	SM	silty sand, white, dense, dry	
64	4	SM	silty sand, fine, white, v. dense, dry	
65/6	5	SM	silty sand, med., fine, brown, v. dense dry	
30				

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So. Calif. Chemical
Santa Fe Springs, Ca.

PLATE

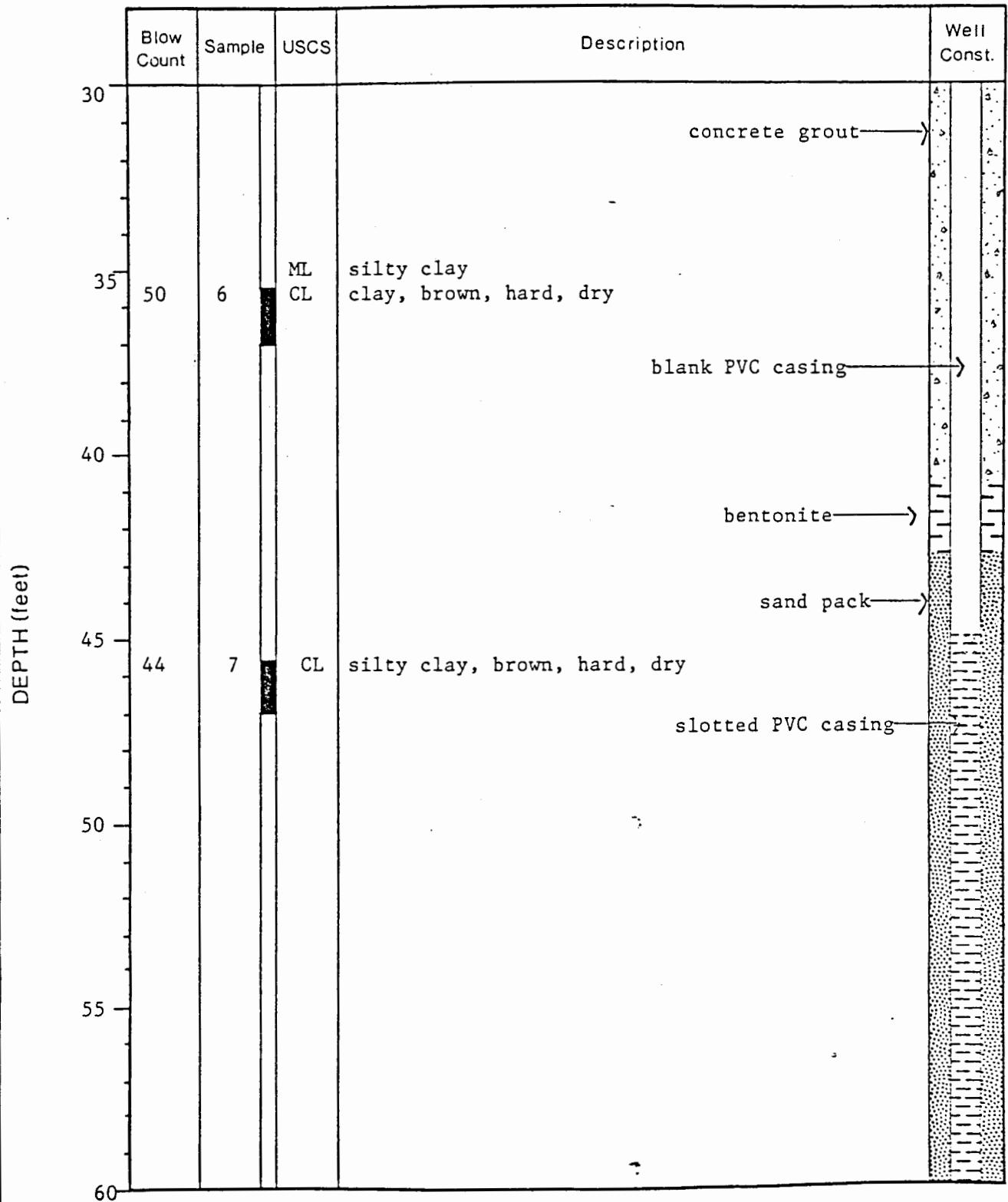
8

PREPARED BY: JF DATE: 5/85

LOG of BORING MW-4

CHECKED BY: DATE:

PROJECT NO. Q-1014-1



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Santa Fe Springs, Ca.

LOG of BORING MW-4

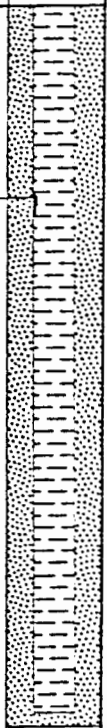
PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. 0-1014-1

PLATE

8

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
60	88/5	8	SM	silty sand, fine, brown, v.dense, wet sand pack → slotted PVC casing →	
65					
70					
75				Boring terminated at 75 ft (El.75') Date of drilling 1-16-85 Elevation of well head 149.76' Materials logged by J.Friedman	

J.H. KLEINFELDER & ASSOCIATES GEOTECHNICAL CONSULTANTS • MATERIALS TESTING		So. Calif. Chemical Santa Fe Springs, Ca.	PLATE 8
PREPARED BY: JF DATE: 5/85		LOG of BORING MW-4	
CHECKED BY: DATE:			

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
0				6" Concrete Lock well cap - PVC cap	
5	10	5	ML	Silt with fine sand, brown, stiff, moist	
10	23	10	ML/SP	Sandy silt/silty sand, brown, dense, moist	
15	41	15	SP	Sand: medium - coarse sand, brown, very dense, dry	
				Blank PVC casing Concrete grout	
20	66	20	SP	Sand, coarse to medium sand, light brown, very dense, dry-damp	
25	98+	25	SP	Medium-coarse sand, light brown-tan, very dense, dry-moist	
30					

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Southern California Chemical

LOG of BORING MW-4A

PREPARED BY:

DATE:

CHECKED BY:

DATE:

PROJECT NO. Q-1014-2

PLATE

9

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
35	80	35	ML/CL	Clayey silt/silty clay, dark brown, very stiff-hard, very moist	
40					
45	80	45			
50					
55					
60					
65					

Blank PVC casing →

Concrete grout →

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Southern California Chemical

LOG of BORING MW-4A

PREPARED BY: DATE:

CHECKED BY: DATE:

PROJECT NO. Q-1014-2

PLATE

9

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
70					
				- Concrete grout	
75					
				Bentonite	
80	53+	80	SP	Sand, fine, brown, dense, wet	
85					
	98	88	SP	Sand, fine-medium, gray, very dense, wet	
90					
				Slotted PVC casing	
95				Sand pack	
100					

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Southern California Chemical


LOG of BORING MW-4A

PREPARED BY: _____ DATE: _____
 CHECKED BY: _____ DATE: _____

PROJECT NO. Q-1014-2

PLATE

9

	Blow Count	Sample	USCS	Description	Well Const.
100	82	100	ML	Silt & very fine sand, brown, very dense, wet	
105		105	ML	Silt, occasional clast 72cm, brown, dense, damp	
110	75	110		Silty sand, brown, very dense, wet	
	75		SM/SP	Sand, fine-medium, very dense, wet	
Boring terminated at 110'. Date of drilling 7-10-85. Materials logged by Ken Durand.					

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Southern California Chemical

LOG of BORING MW-4A

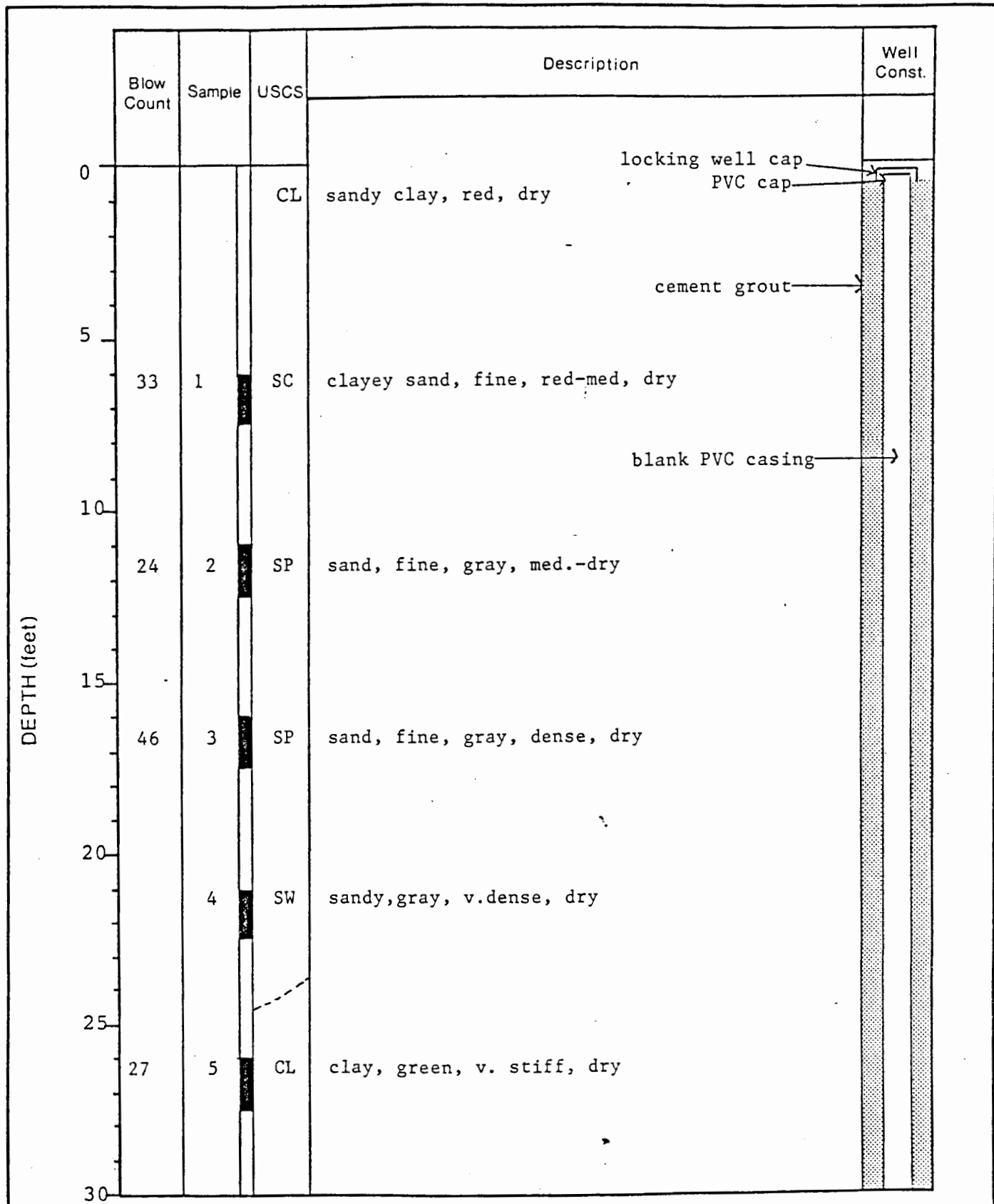
PROJECT NO. Q-1014-2

PLATE

9.

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So. Calif. Chemical
Santa Fe Springs

PLATE

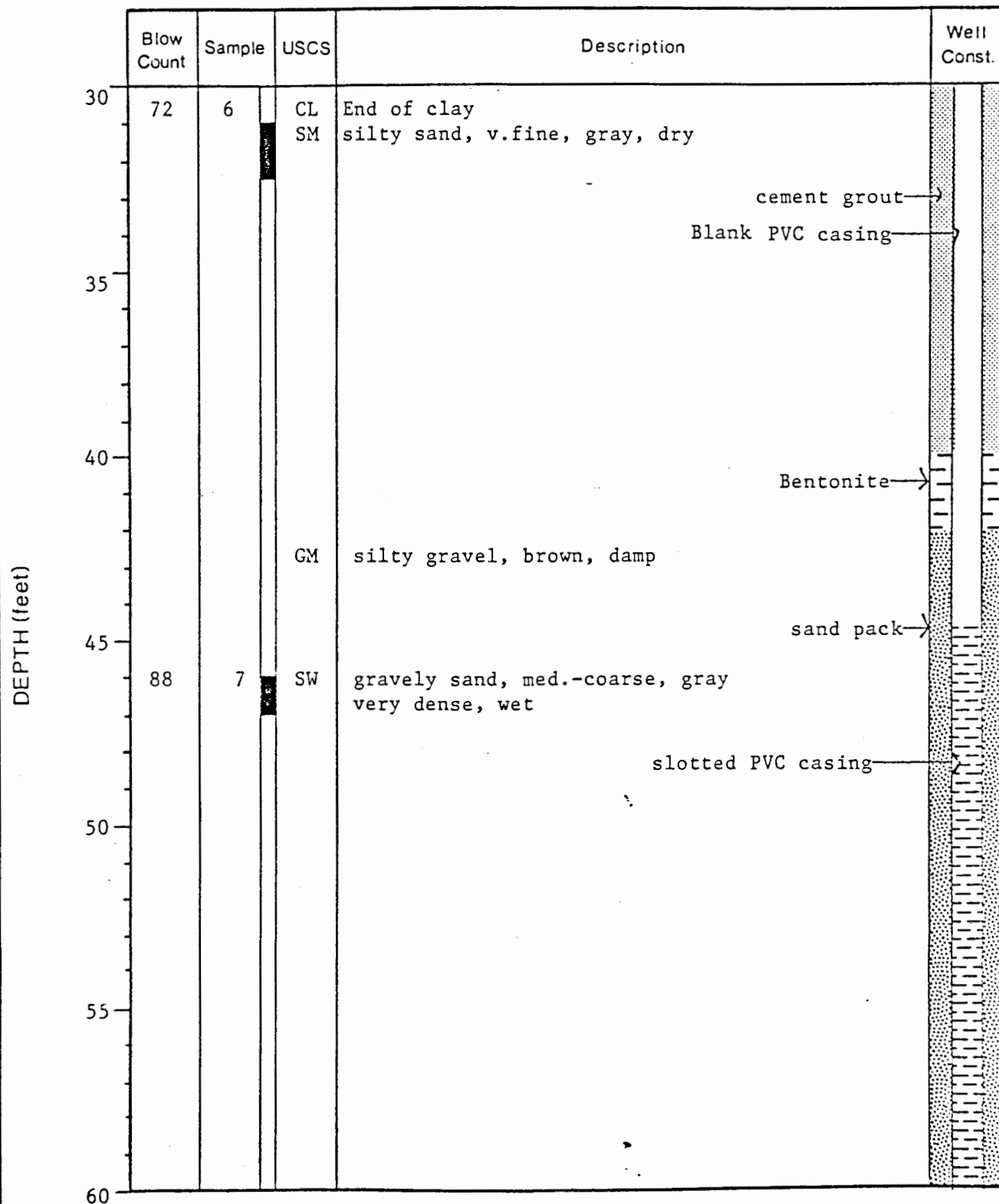
10

PREPARED BY: JF DATE: 5/85

LOG of BORING MW-5

CHECKED BY: DATE:

PROJECT NO. 1014-1



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So. Calif. Chemical
Santa Fe Springs

PLATE

LOG of BORING MW-5

10

PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. Q-1014-1

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
60					
				sand pack →	
65			SW	sand, med to coarse, grain up to 1/2"	
				slotted PVC casing	
70					
75				Boring terminated at 75 ft. (El. 78') Date of drilling was 1-13-85 Elevation of well head 153.21 Materials logged by J. Friedman	

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So. Calif. Chemical
Santa Fe Springs

PLATE

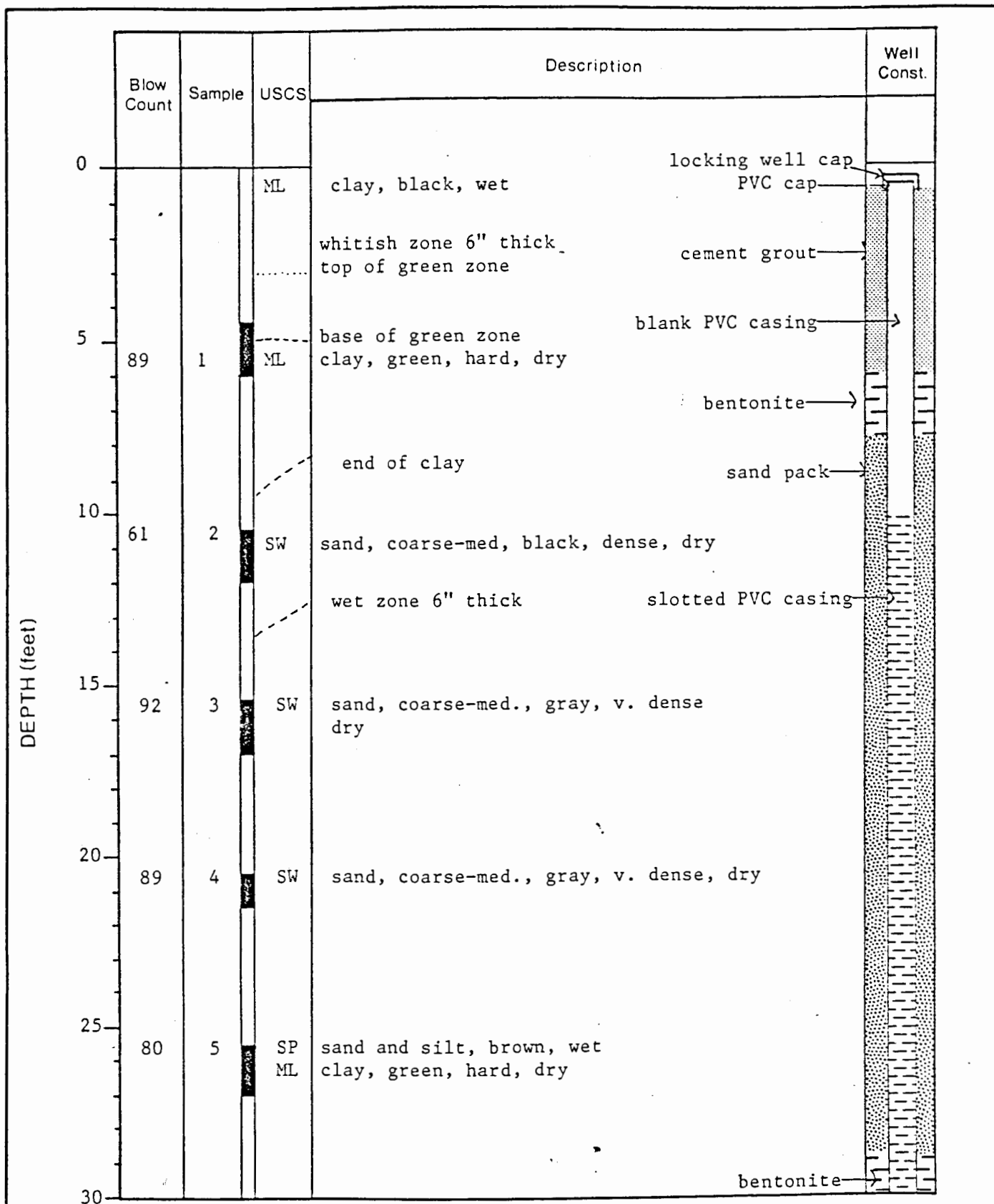
10

PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

LOG of BORING MW-5

PROJECT NO. Q-1014-1



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Santa Fe Springs, Ca.

PLATE

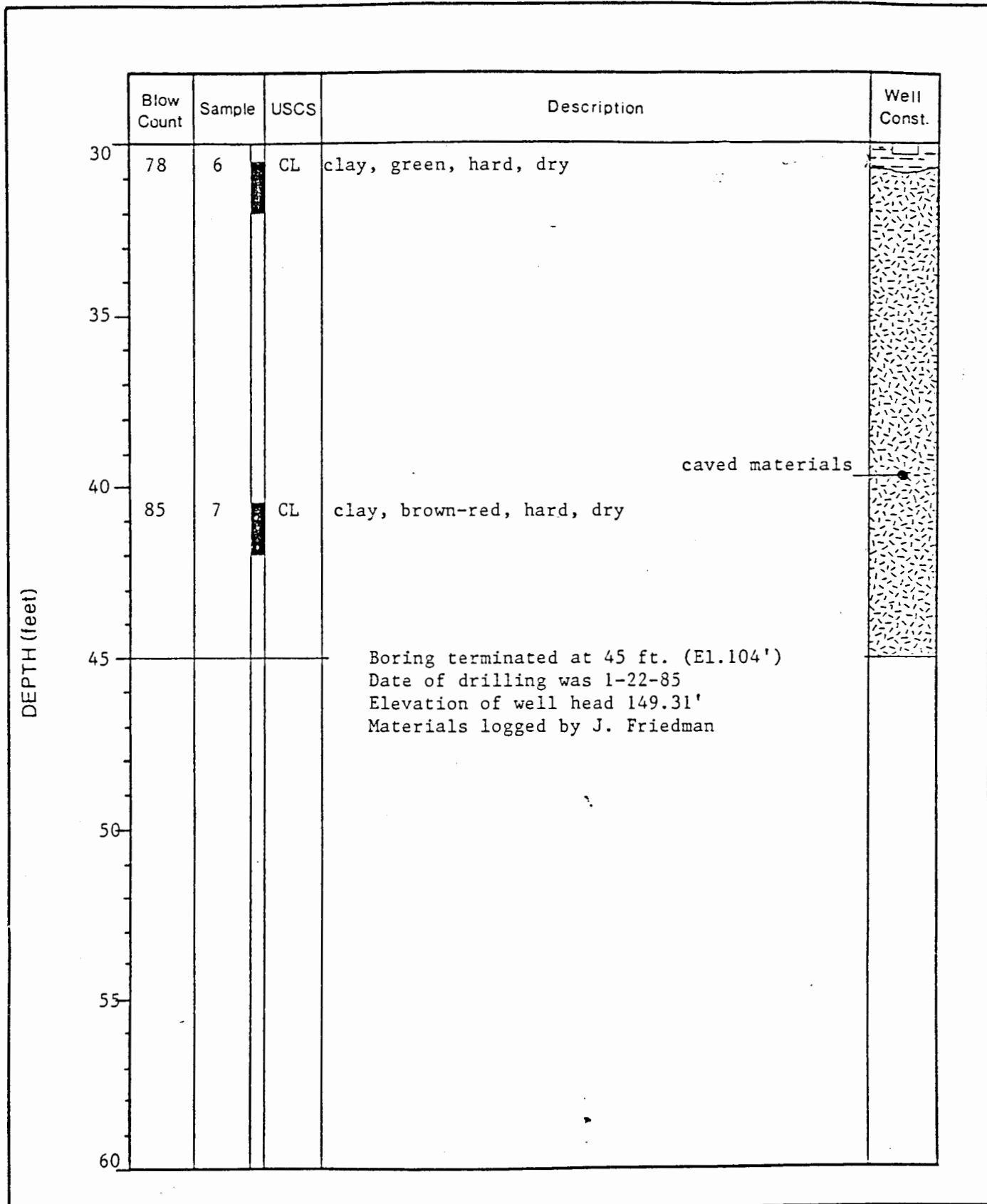
LOG of BORING MW-6A

11

PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. Q-1014-1



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So. Calif. Chemical
Santa Fe Springs, Ca.

LOG of BORING MW-6A

PREPARED BY: JF DATE: 5/85

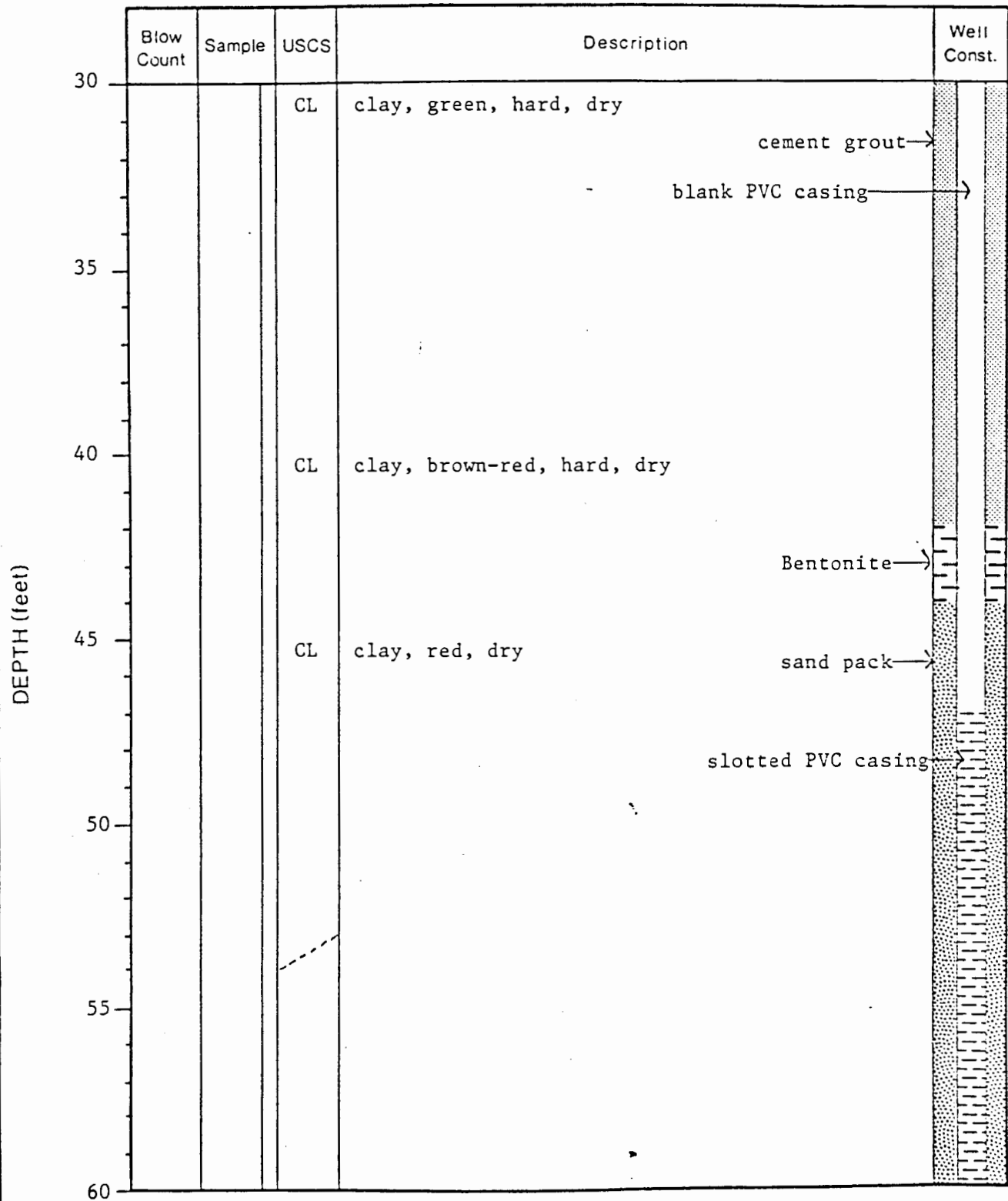
CHECKED BY: DATE:

PROJECT NO. Q-1014-1

PLATE

11

12



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Santa Fe Springs

LOG of BORING MW-6B

PREPARED BY: JF DATE: 5/85

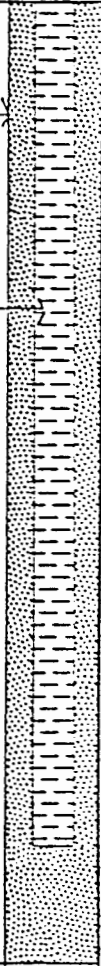
CHECKED BY: DATE:

PROJECT NO. Q-1014-1

PLATE

12

DEPTH (feet)

	Blow Count	Sample	USCS	Description	Well Const.
60	52/6	1	SW	sand, med.-fine, white, v. dense wet	
65					
70					
75					
80				Boring terminated at 80 feet (El± 69.5 ft) Date of drilling was 1-22-85 elevation of well head 149.46ft materials logged by J. Friedman	

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Santa Fe Springs

LOG of BORING MW-6B

PREPARED BY: JF DATE: 5/85

CHECKED BY: DATE:

PROJECT NO. 1014-1

PLATE

12

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
0				Pebbles	
				Locking well cover PVC cap	
5	16	5	ML	Sandy silt, silt with fine sand, Lt. brown, med. damp	
				Cement	
10	40	10	*		
				Blank PVC well casing	
15	25	15	SP	Sand, med. to fine sand, tan, loose, damp	
20	62	20	SP	Sand, med., Lt. tan, dense, damp	
25	67	25	SP	Sand, med. to fine, Lt. brown-tan, very dense, damp	
30					

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So. Cal. Chemical

SANTA FE SPRINGS, CALIFORNIA

LOG of BORING MW-7

PLATE

13

PREPARED BY: DATE:

CHECKED BY: DATE:

PROJECT NO. Q1014-2

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
	30				
35	29	35	ML	Clayey silt: clayey silt with small amount fine sand. Brown, very stiff, moist	
40				Bentonite	
45	25	45	CL	Silty dry: Reddish-brown, stiff, moist	
50				Area of caving 0.020" machine slotted PVC well casing	
55					
60					

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PREPARED BY: _____ DATE: _____		PROJECT NO. Q1014-2		
CHECKED BY: _____ DATE: _____				

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
0				6" concrete Lock well cap PVC cap	
5	15	5	ML	Silt: Silt with fine sand, black medium stiff, moist	
				Cement grout Blank PVC casing	
10	42	10	ML	Silt: silt with fine sand, black- dk. brown, stiff to moist.	
15	38	15	SP	Sand: fine sand, dk. grey, dense moist	
20	94	20	SP	Sand: fine to med. sand grey, hard, moist	
25	90/ 5	25	SW	Sand: coarse sand/gravilly sand, grey-white, v. dense, damp	
30					

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So. Cal. Chemical
SANTA FE SPRINGS, CALIF.

LOG of BORING MW-8

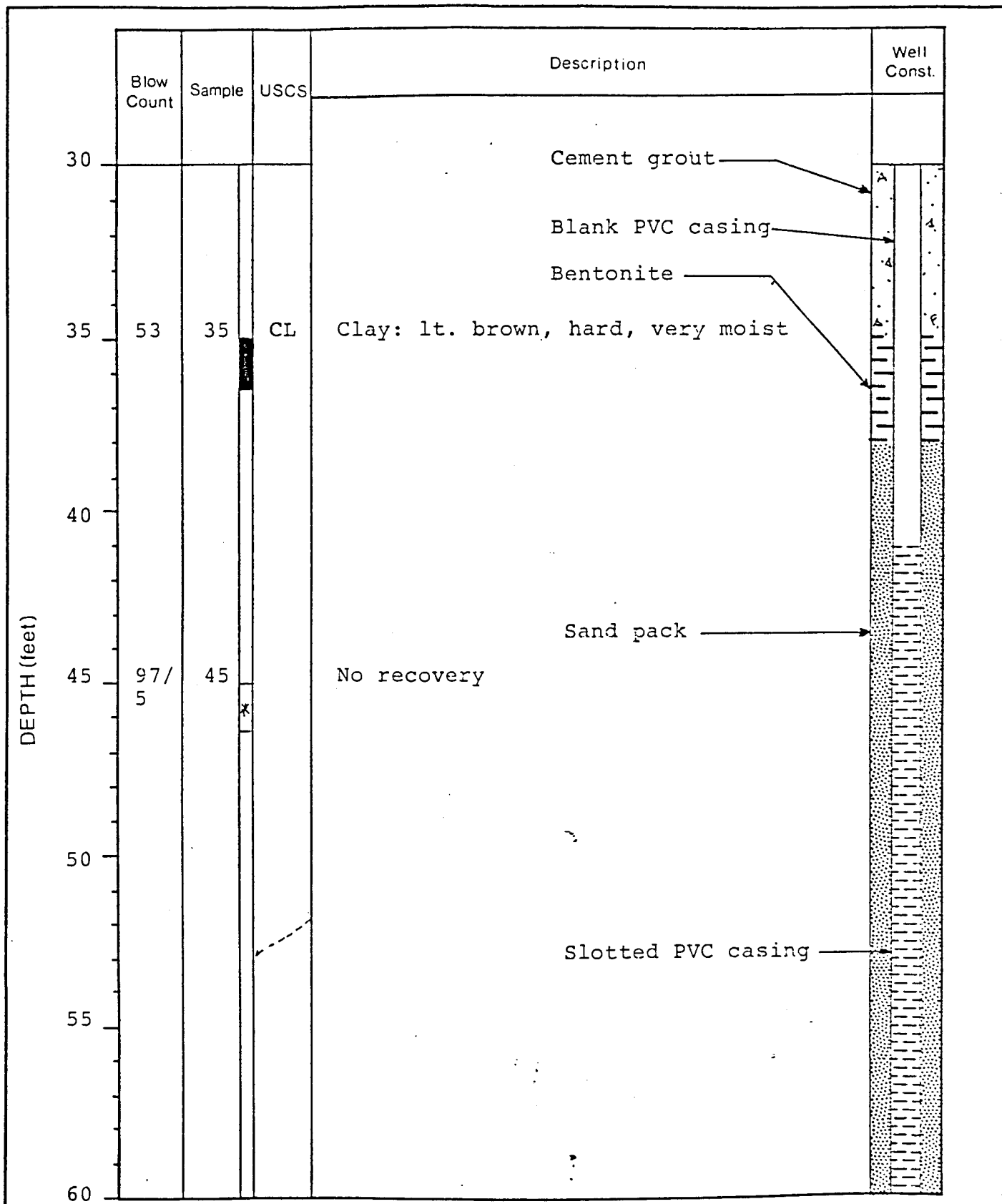
PLATE

14

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PROJECT NO. 01014-2



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So. Chemical Co.

SANTA FE SPRINGS, CALIFORNIA

LOG of BORING MW-8

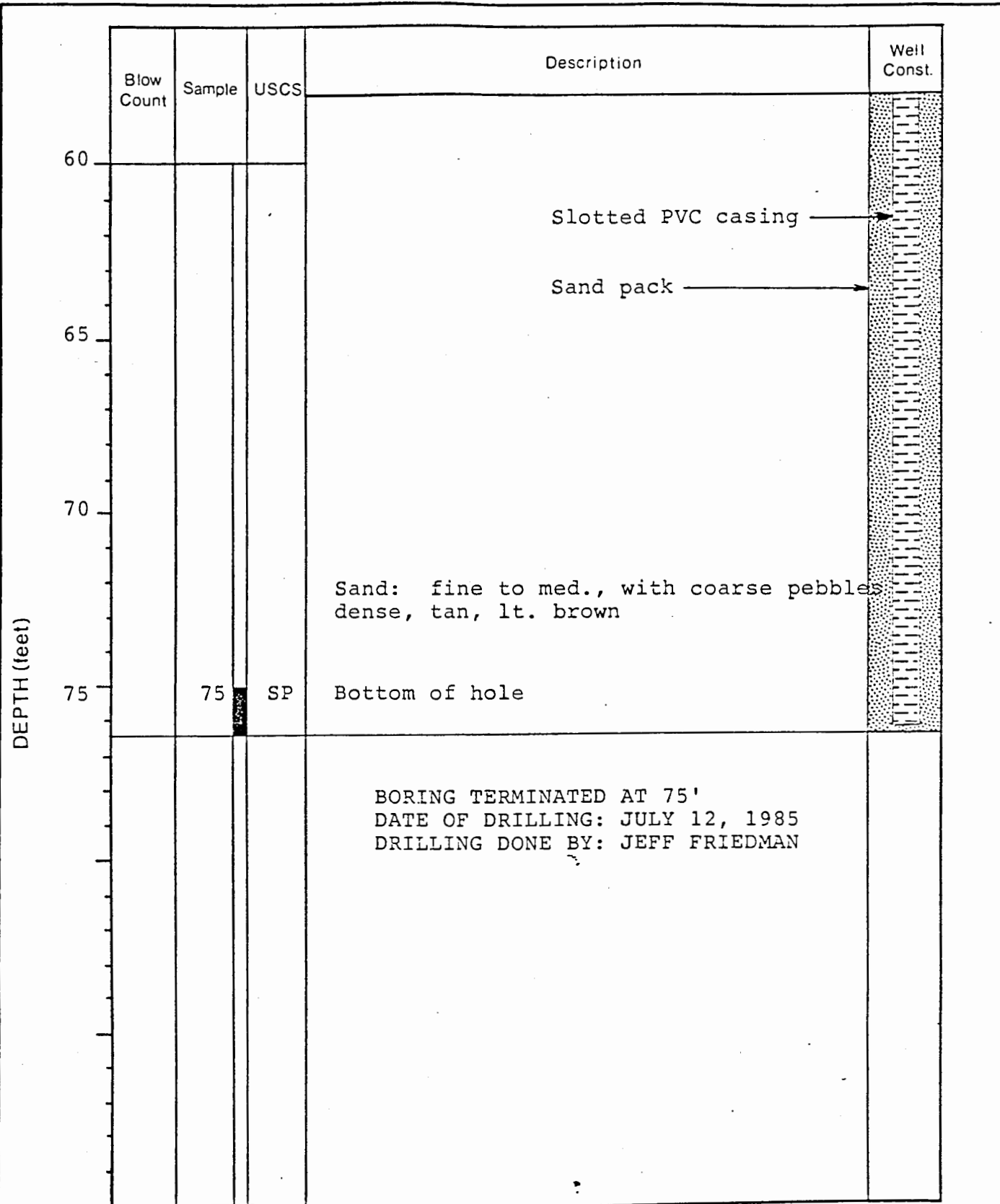
PLATE

14

PREPARED BY: DATE:

CHECKED BY: DATE:

PROJECT NO. Q1014-2



J.H. KLEINFELDER & ASSOCIATES GEOTECHNICAL CONSULTANTS • MATERIALS TESTING		So. Chemical Co. SANTA FE SPRINGS, CALIFORNIA		PLATE 14
PREPARED BY: _____ DATE: _____		LOG of BORING MW-8		
CHECKED BY: _____ DATE: _____		PROJECT NO. Q1014-2		

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
0				6" concrete Locking well cap PVC cap	
5	10	5	ML	Silt, silt with fine sand, black, soft, very moist	
10	30	10		No recovery Cement grout	
15	39	15	SP	Sand: fine sand with interbedded silt lens, tan-reddish, med. dense, moist Blank PVC casing	
20	68	20	SW	Sand: med. to coarse sand with pebbles up to ½", tan, very dense, damp	
25	99/ 4	25	SW	Sand: coarse sand with ground, grey pebbles up to 1". V. dense, moist	
30					

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So. Cal. Chemical Co.
 SANTA FE SPRINGS, CALIFORNIA
LOG of BORING MW-9

PLATE
15

PREPARED BY: _____	DATE: _____
CHECKED BY: _____	DATE: _____
PROJECT NO. Q1014-2	

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
30					
				Cement grout	
35	82	35	ML	Sandy silt: silt with fine sand, brown, very stiff, dry-med.	
				Bentonite	
40					
45	84	45	ML	No recovery	
				Sand pack	
				Slotted PVC casing	
50					
55					
60					

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 SANTA FE SPRINGS, CALIFORNIA

LOG of BORING MW-9

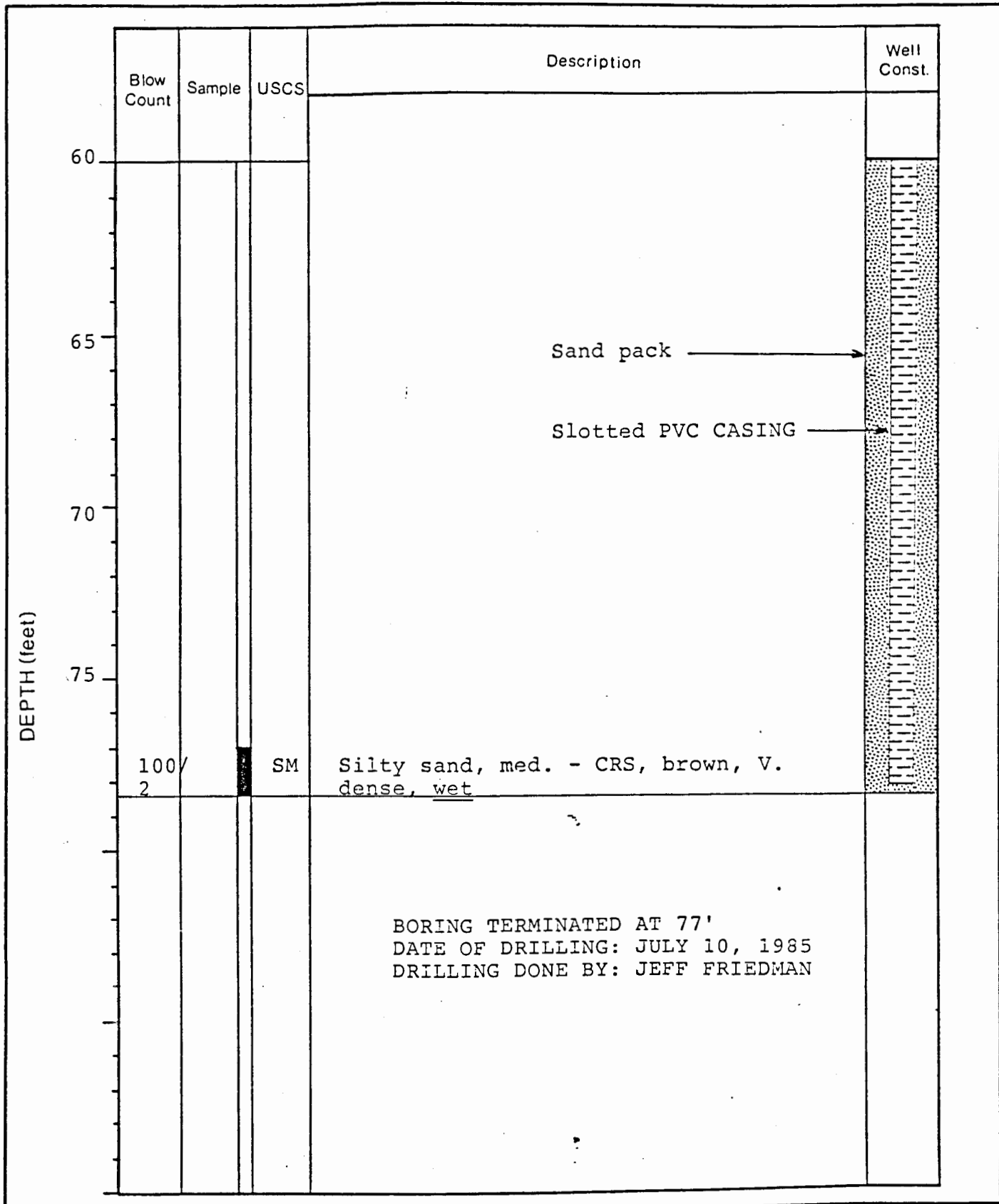
PROJECT NO. Q1014-2

PLATE

15

PREPARED BY: _____ DATE: _____

CHECKED BY: _____ DATE: _____



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SANTA FE SPRINGS, CALIFORNIA
LOG of BORING MW-9

PREPARED BY: DATE:

CHECKED BY: DATE:


PROJECT NO. Q1014-2

PLATE

15

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
0				6" concrete	locking well cap PVC cap
5	14	7	ML	Sandy silt, black, med. dry	cement grout
10	28	4	ML	Clayey silt, brown, med. stiff damp	blank PVC casing
15	44	15	SP	Sand, med. to fine sand, brown, very dense, dry	
20	45	20	SP	Sand, fine to med. dense, dry	
25	90	25	SP	Sand, med. to fine, tan-hard, damp	
30					

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So. Cal. Chemical

LOG of BORING MW-10

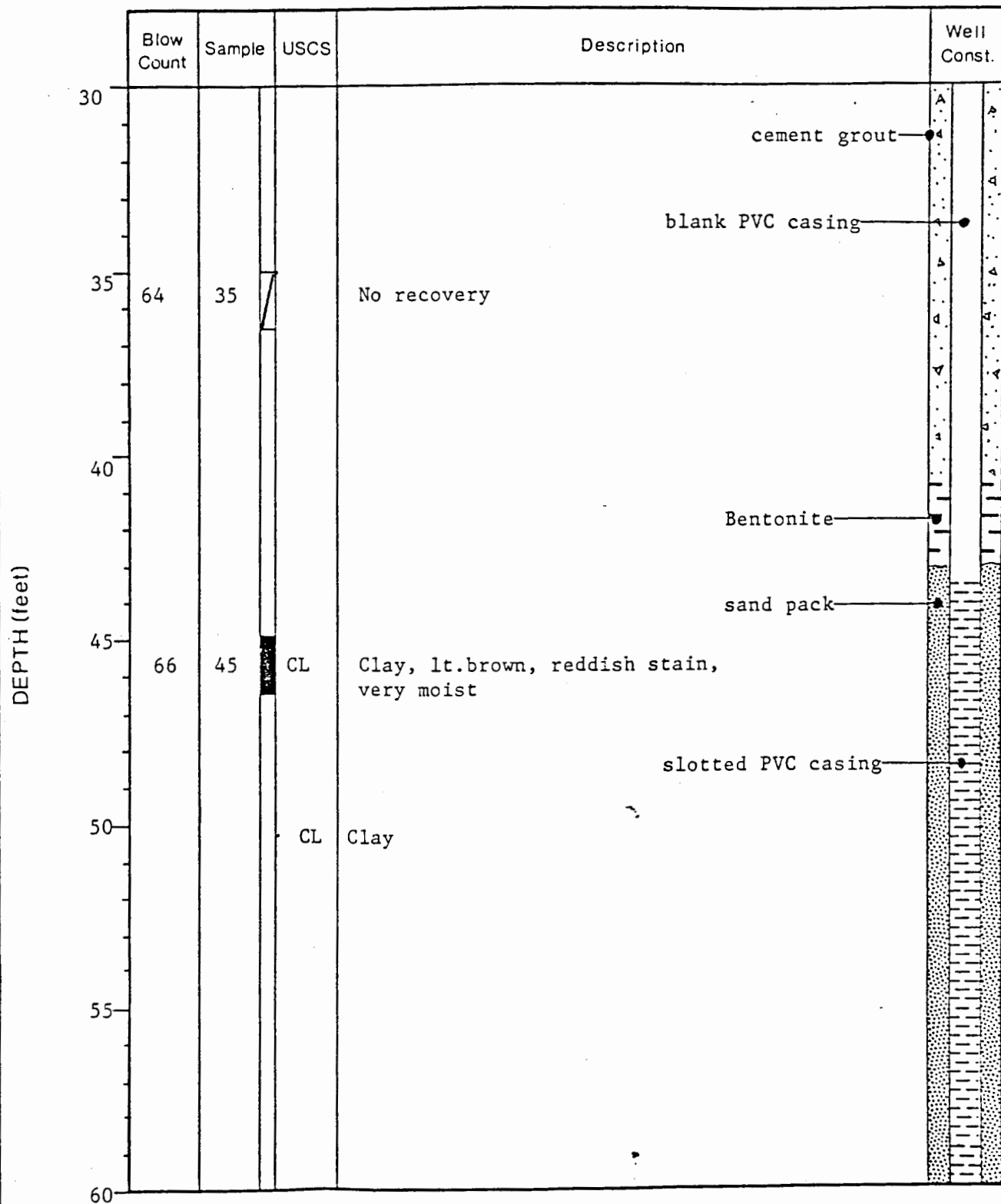
PROJECT NO. Q1014-2

PLATE

16

PREPARED BY: GH DATE: 7-85

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PLATE

LOG of BORING MW-10

16

PREPARED BY: GH DATE: 7-85

CHECKED BY: DATE:

PROJECT NO. Q1014-2

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
60			SP	Sand, fine	
				<p>sand pack</p> <p>slotted PVC casing</p>	
65					
70					
75				<p>Boring terminated at 75'</p> <p>Date of drilling was 4-10-85</p> <p>Materials logged by K. Durand</p>	
80					
85					

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LOG of BORING MW-10

PREPARED BY: GH DATE: 7-85

CHECKED BY: _____ DATE: _____

PROJECT NO. 01014-2

PLATE

16

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
0				6" Concrete	
5	28	5	SC	Clayey sand, med. to fine with clay dark brown, dense, dry	
10	14	10	SM	Silty sand, med. to fine, with silt brown, loose, damp	
15	26	15	SP	Sand, fine, med., lt. brown, loose dry	
20	29	20	SP	Sand, coarse to med. tan-white med. dense, damp	
25	91	25	SP	Sand, med. to coarse sand with pebbles up to 3/8 " tan, very dense, damp	
30					

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LOG of BORING MW-11

PREPARED BY: GH DATE: 7-85

CHECKED BY: DATE:

PROJECT NO.

PLATE

17

DEPTH (feet)

	Blow Count	Sample	USCS	Description	Well Const.
30					
35	64	35	ML	Sandy silt, silt with fine sand dark brown, very stiff, moist	
40					
45	49	45	ML CL	Silty clay, clayey silt, dense, very stiff, moist	
50					
55	41	55	CL	Clay, brown, saturated	
60					

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PREPARED BY: DATE:

CHECKED BY: DATE:

LOG of BORING MW-11

PROJECT NO.

PLATE

17

DEPTH (feet)

Blow Count	Sample	USCS	Description	Well Const.
60				
65				
70				
75	90	75	SP Sand interbedded fine & med. sand, tan-grey, very dense, saturated	
80			Boring Terminated at 76.5 feet Date of drilling was 7-8-85 Materials logged by J. Friedman	

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PREPARED BY: GH DATE: 7-85

CHECKED BY: DATE:

LOG of BORING MW-11

PROJECT NO. 6000-1

PLATE

17

DEPTH (feet)

	Blow Count	Sample	USCS	Description	Well Const.
0				4" concrete	
			SM	Silty sand, black, moist slant at 30	
5	9	5	ML	Silt, silt with fine sand, black medium, moist	
10	75	10	ML	Sandy silt, silt with fine sand brown, black-reddish, very stiff very moist	
15	52	15	SP	Sand, med. to fine sand brown, dense, damp	
20	20	99 +	SW	Sand, med to coarse, very little fines, tan, very dense, damp	
25					
30					

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So. Calif. Chemical

PLATE

LOG of BORING B-1

18

PREPARED BY: GH DATE: 7-85
CHECKED BY: DATE:

PROJECT NO. Q1014-2

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
30	80	30	SP	Sand med.to coarse sand tan, very dense, damp , only 3" sample	
35					
40	78		ML	sandy silt, silt with fine sand drk.brn, very stiff, moist	
45					
50	82	50	CL	Clay,very stiff, brown-green, wet	
55				Boring terminated at 50 feet Date of drilling was 7-9-85 Material logged by K. Durand	
60					

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So. Calif. Chemical

PLATE

LOG of BORING B-1

18

PREPARED BY: GH DATE: 7-85

CHECKED BY: DATE:

PROJECT NO. Q1014-2

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
0			SP	6" concrete Slant at 28° Sand, fine sand black, moist	
5	39	5	ML/CL	Silt/clay brown, very stiff, dry	
10	78	10	CL	clay, brown clay very stiff-hard, damp	
15	15	64	SP	Sand, med.sand, lt brown-tan very dense dry	
20	20	22	Sp	Sand, med. sand tan-red med. dense, dry	
25	25	76		no recovery	
30					

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PREPARED BY: GH DATE: 7-85			
CHECKED BY: DATE:			

DEPTH (feet)

	Blow Count	Sample	USCS	Description	Well Const.
30	99/3	30	SP ML	sand, med. to coarse sand lt.brown tan very dense dry Sandy silt, lt.brown-tan, very stiff moist	
35	68	10	ML	clayey silt, silt with clay, tan-reddish stiff damp	
40	96/4	40	CL	silty clay, very silty dark grey, moist	
45				Boring Terminated at 40 feet Date of drilling was 7-9-85 Materials logged by K. Durand	
50					
55					
60					

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So. Calif. Chemical

LOG of BORING B-2

PREPARED BY: GH DATE: 7-85

CHECKED BY: DATE:

PROJECT NO. Q1014-2

PLATE

19

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
0				6" concrete	
			SM	Silty sand, fine sand & silt with pebbles up to 3/4", damp	
5	20	5	SM	Silty sand, fine sand and silt, med.dense damp, drk.brown	
10	41	10	SM	Silty sand, fine sand and silt dense, moist drk.brown	
15	52	15	SP	Sand, med. sand, tan,very dense,moist	
20				Boring terminated at 15'. Date of drilling was 7/8/85. Materials logged by K. Durand.	
25					
30					

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So. Calif. Chemical

PLATE

LOG of BORING B-3

20

PREPARED BY: GH DATE: 7-85

CHECKED BY: DATE:

PROJECT NO. Q1014-2

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
0			SP	6" concrete Sand, med. sand with pebbles up to 3/8" brown, dry	
5	33	5	ML	Silt with fine sand yellow stain, very stiff, dry	
10	54	10	ML	Silt with fine sand, yellow-brown, very stiff, dry-damp	
15	71+	15	ML	Silt with fine sand, brown, very stiff, damp	
20	100+	20	SP	Sand, med. to coarse sand with 1/2" rounded pebbles drk.brown-reddish very dense, damp	
25	97	25	SP	Sand coarse to med.sand tan-grey, very dense damp	
30					

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PLATE

LOG of BORING B-4

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PREPARED BY: GH DATE: 7-85

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PROJECT NO. Q1014-2

DEPTH (feet)

30

Blow Count	Sample	USCS	Description	Well Const.
88	30	ML SP	Silt & Sand, brown very dense, damp Boring terminated at 30 feet Date of drilling was 7-9-85 Materials logged by K. Durand	

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LOG of BORING B-4

PREPARED BY: GH DATE: 7-85

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PROJECT NO. Q1014-2

PLATE

21

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
	0				6" concrete
5	14	5	ML	Sandy silt: silt with fine sand, dark brown, med. stiff, moist	
10	20	10	ML	Sand silt, silt with fine sand and clay, brown-reddish, stiff, dry	
15	31	15	ML	Silt with clay, brown-reddish, stiff, damp	
20	91/4	20	SP	Med. to fine sand, grey-brown, very dense damp	
25	73	25	SW	gravelly sand, sand with pebbles up to 1 1/2" dia. grey, hard, damp	
30					

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LOG of BORING B-5

PROJECT NO. Q1014-2

PREPARED BY: GH DATE: 7-85
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PLATE
22

DEPTH (feet)

	Blow Count	Sample	USCS	Description	Well Const.
30	91/5	30	SW	Sand- med. to coarse sand, grey very dense, moist/wet Boring Terminated at 30 feet Date of drilling was 7-12-85 Materials logged by K. Durand	

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LOG of BORING B-5

PREPARED BY: GH DATE: 7-85

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PROJECT NO. Q1014-2

PLATE

22

DEPTH (feet)	Blow Count	Sample	USCS	Description	Well Const.
0					
5	14	5	ML CL	Silt/clay, yellow, soft, moist	
10	40	10		No recovery	
15	41	15	SP	Sand, fine sand with silt, brown reddish, very dense, dry	
20	70	20	SP	Sand, med. to coarse sand red-brown very dense moist, very little fine	
25	93+	25	GP SW	Sandy gravel, gravelly sand, rounded pebbles up to 1/2", very dense, damp	
30					

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PREPARED BY: GH DATE: 7-85		PROJECT NO. Q1014-2		
CHECKED BY: DATE:				

DEPTH (feet)

Blow Count	Sample	USCS	Description	Well Const.
30	57	ML	Sandy silt, silt with coarse sand very stiff moist, wet	
			Boring terminated at 30 feet Date of drilling was 7-9-85 Materials logged by K. Durand	

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LOG of BORING B-6

PREPARED BY: GH

DATE: 7-85

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DATE:

PROJECT NO. Q1014-2

PLATE

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